Industry and Power

April 1955

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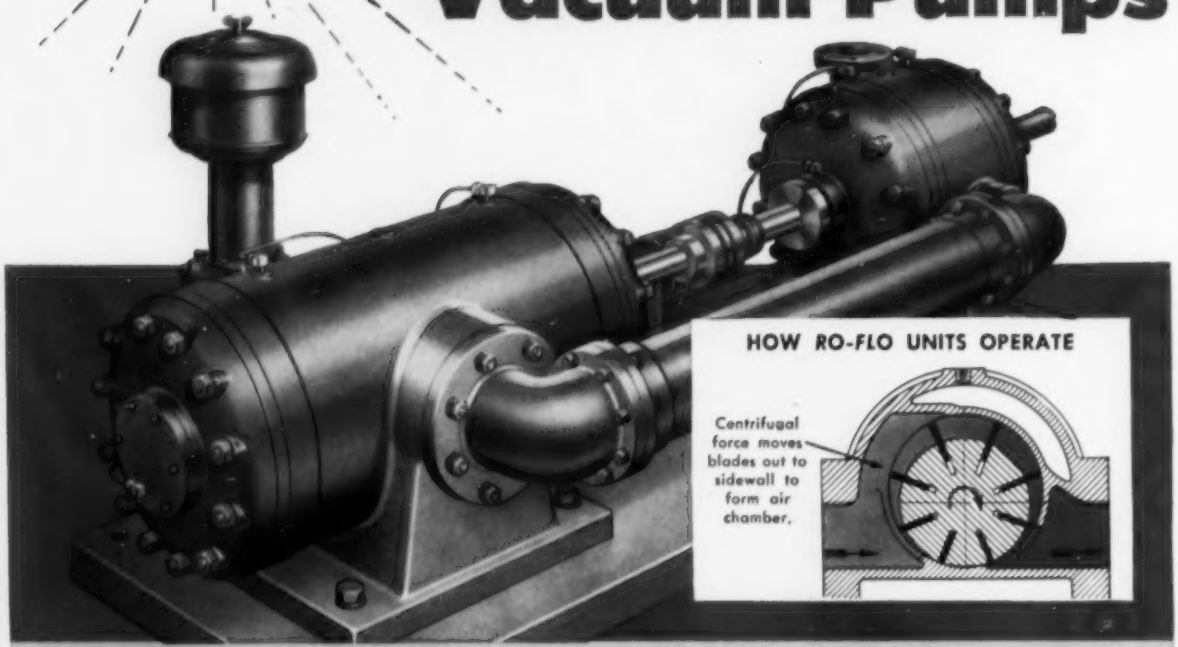
ALLIS-CHALMERS

NEW 100-lb Compressors

0.3-in. Mercury Absolute Vacuum Pumps



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Now—the *Ro-Flo* line is extended to include high pressure as well as low pressure units to give you three important advantages:

Constant efficiency — Automatic compensation for wear is inherent in *Ro-Flo* design. During operation, rotor blades slide against the sidewall to form air cells. Any blade wear from this action is compensated for by the rotating force which holds blades in contact with the cylinder.

Simple foundation requirements — The smooth rotation of the *Ro-Flo* unit cuts vibration and eliminates need for heavy, expensive foundations.

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Two-stage *Ro-Flo* compressors can be furnished in any of 12 sizes to handle from approximately 250 to 1800 cfm at pressures from 65 to 125 pounds gauge. Vacuum pumps furnished from 200 to 5040 cfm at 29.7 inches Hg vacuum, with shut-off of 29.9 inches Hg, referred, or better. Single-stage units are built for pressures up to 50 pounds gauge, 65 pounds absolute. Single-stage pumps for vacuums up to 28 inches Hg referred.

A-4569

GET INFORMATION

Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

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I-T-E Urelites are available through your local I-T-E distributor in four types of enclosures: general purpose, panel-mounted, weatherproof, and dustproof; and with auxiliary and tripping devices to fit specific applications. Ask him for literature or, if more convenient, write I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.

I-T-E Type KA. 15,000 amp interrupting capacity. 15-225 amp continuous. 600 v a-c, 250 v d-c. 2, 3 and 4 pole.

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I-T-E CIRCUIT BREAKER COMPANY

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Industry and Power

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acorns

. . . recently announced . . . worth watching

Sintered Nylon

● Parts formed by cold pressing and oil sintering nylon powders have been found to possess an unusually low coefficient of friction in a wide range of industrial mechanical applications. Sintered nylon shows greater wear resistance and dimensional stability in nonlubricated applications than standard injection molded FM-10001. National Polymer Products, Inc. report that these properties will increase the usefulness of nylon for gears, bearings, rollers, and similar parts subjected to light loads. Sintered nylon costs no more than molded nylon and mass production of sintered parts will therefore be economical and practical. The unusually low coefficient of friction in sintered nylon is obtained by the addition of various inert filler materials to the powder formulations, and also by the penetration of oil from the sintering bath into the pores of the nylon. Available fillers include graphite and molybdenum disulfide.

Semiconduction Found In Liquids

● The Carnegie Institute of Technology Metals Research Laboratory announces that it has found a liquid that behaves electrically like a solid semiconductor. The best known example of semiconduction in a solid is the transistor which is made of solids like germanium or silicon, and conducts electronically rather than ionically. This phenomenon of semiconduction has been found in molten metallic sulfides. Existing theories on the nature of semiconduction cannot account for the new discovery, since they apply exclusively to solids and not to liquids where the atoms are disordered.

Brazing

● To separate fact from theory, the Pitman-Dunn Laboratories of Frankford Arsenal initiated a fundamental study of brazing. Experimental work has disproved the theory that joint strengths required the formation of intermetallic compounds at the filler metal-base metal interfaces. Diffusion bonding and self-fluxing brazing alloys are being patented.

Sealed Miniature Switch

● Minneapolis-Honeywell Regulator Co. announces that it has completely sealed a miniature snap-action switch. Sealing is achieved with a silicone rubber plunger seal, bonded both to the pin plunger and metal housing. This unit is embedded in an epoxy casting resin inside the housing. The switch is designed for application where small size, light weight, and environment-proof construction are required, and laboratory tests indicate a life expectancy of 300,000 operations.

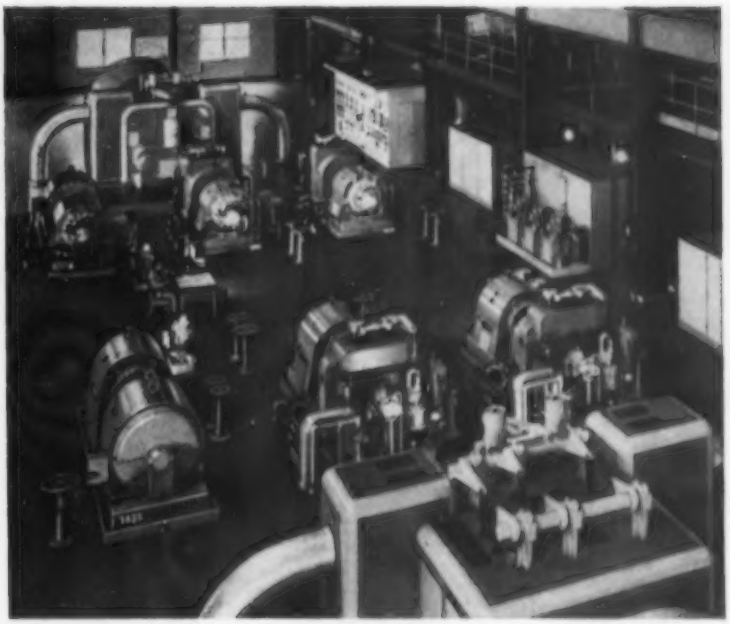
Substructure of Metals

● Little is known of the fundamental reasons why metals break. An experimental study of the origin, size, shape, and distribution of microscopic cracks in iron was made recently by GE research metallurgists. Cracks less than a thousandth of an inch wide sometimes appear after the slightest amount of deformation. The tendency of the cracks to grow in size was related to iron's fracture strength. The relationship accurately describes and predicts the tendency of iron to break under severe service conditions. Substructure, or the configuration within the grains of metals, is important in determining how metals will deform at elevated temperatures. GE metallurgists developed a new method of studying substructure by direct microscopic observation, supplementing x-ray diffraction techniques.

Metal To Metal Adhesives

● A resinous type of adhesive that can substitute for the more expensive soft solder in certain metal-to-metal bonds has been tested by the Army Chemical Center in Maryland. Known as Araldite 115, this epoxide resin was used in place of soft solder for bonding galvanized steel screens to cold-rolled steel shrouds in bomb tailfin assemblies. Use of the resin would save large quantities of tin and lead as well as reducing costs by as much as 50 percent. Tensile tests after storage in desert, tropical and arctic conditions show it to be equal in strength to soft solder under all three conditions.

What makes a barrel-type boiler feed pump *stay in service?*



Here are some of the design features that assure dependability

Today's modern multi-stage centrifugal pumps for boiler feed service are the result of years of research and design. To provide efficient service *plus* dependability, De Laval has incorporated these important features in its barrel-type pump.

Double Volute Diaphragms

Double volute diaphragms provide for radial hydraulic balance and assure a continuous rising head characteristic from the design point to shut-off. *RESULT—Higher efficiencies are maintained over a wider range of operation than are generally obtained with other forms of velocity pressure conversion.*

Individual Diaphragm Bolting

Elimination of rabbet fits and gaskets permits straight metal-to-metal contact of adjacent lapped faces of the diaphragms which are individually bolted together to maintain tight joints and ease of assembly. *RESULT—Positive assurance against inner case leakage, complete elimination of misalignment causes and a minimum of distortion from sudden temperature changes.*

Positive Sealing Between Suction and Discharge Chamber

Inner assembly is held at the inner high pressure joint at the suction end of the barrel, against a flexitallic gasket, with through bolts. The joint between the suction and discharge chambers is made tight during assembly—remains tight whether pump is operating or idle. *RESULT—No possibility of leakage or gasket loosening due to changes of force on the inner joint.*

Bare Shaft

Bare shaft construction with split ring-shrink fit method of impeller mounting permits a scalloped shaft design and eliminates the need for spacer sleeves between impellers. *RESULT—Better hydraulic conditions at the eye of the impeller and elimination of spacer sleeves—the greatest cause of shaft warpage.*

Wearing Rings

Diaphragms and impellers have renewable wearing rings. Impeller rings are threaded on the impeller hubs against rotation, and diaphragm rings are held by a breech lock fit in the diaphragms. *RESULT—Construction permits renewal of original clearances without major part renewal or modification. Labyrinth type diaphragm ring results in minimum leakage over a longer period of time than with close clearance flat rings.*

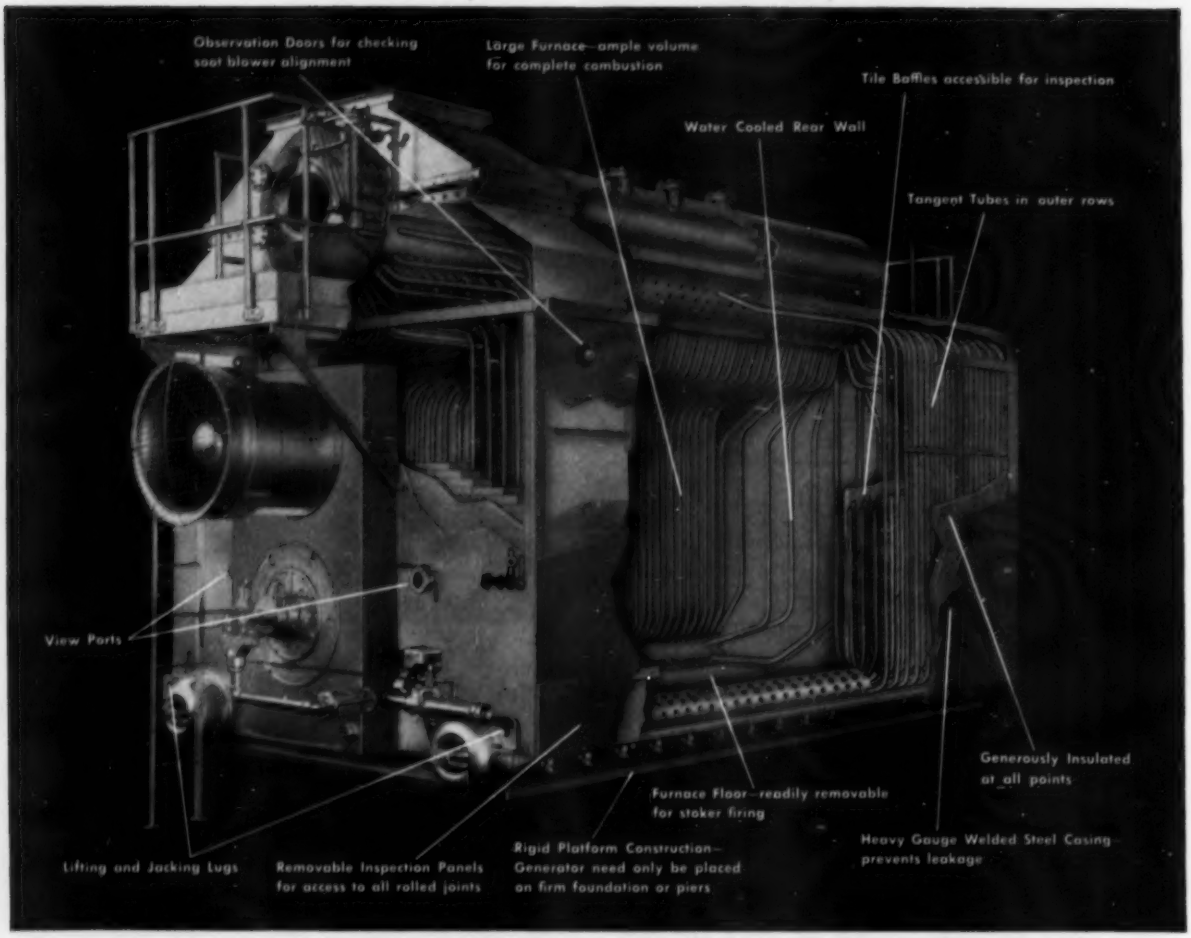
IMO Oil Pump

A De Laval IMO pump designed for high speed operation is direct-connected to the outboard end of the barrel pump shaft, and is sized to lubricate both pump and driver bearings. *RESULT—Quiet, pulsation-free, positive displacement IMO pumps, assures positive lubrication and eliminates the need of extra shaft length and mechanical complications required by gear drive lube oil pumps.*

BULLETIN CONTAINS HELPFUL DATA

This De Laval bulletin on the barrel-type boiler feed pump covers all major design points . . . has cross-section cut-away illustration for easy reference. Write on your business letterhead for your copy of Bulletin 1506 to De Laval Steam Turbine Company, 857 Nottingham Way, Trenton 2, New Jersey.

Circle 504 on Reply Card for more data


Observation Doors for checking soot blower alignment
Large Furnace—ample volume for complete combustion
Tile Baffles accessible for inspection
Water Cooled Rear Wall
Tangent Tubes in outer rows
View Ports
Generously Insulated at all points
Furnace Floor—readily removable for stoker firing
Heavy Gauge Welded Steel Casing—prevents leakage
Lifting and Jacking Lugs
Removable Inspection Panels for access to all rolled joints
Rigid Platform Construction—Generator need only be placed on firm foundation or piers

Union Type "MH" Packaged Steam *successfully patterned after job-proved field*

Shop-assembled units handle multitudes of needs formerly requiring costly field erection and special engineering

Erie, Pa. (UIW) — Although packaged water tube boilers are generally a relatively recent development, the Union Type MH Packaged Unit boasts a long record of accomplishment. Its success stems from its compact, balanced, 3-drum design patterned after larger but similar field erected Type H Boilers originated 16 years ago by Union Iron Works, Erie, Pa.

MEETS BROAD RANGE OF STEAM REQUIREMENTS

Delivered by rail or truck, completely shop assembled MH Units can be fitted with components to meet a wide range of steam requirements. Standard units are designed in 13 sizes with capacities ranging from 10,000 to 40,000 lbs. of steam per hour with pressures of 250 psi. Furnished for oil or gas firing, or both, as well as refuse and by-product fuel consumption, MH Steam Generators are equipped with fully automatic, semi-automatic or manual ignition and combustion controls.

HANDLES UNUSUAL AND SPECIAL NEEDS

High pressure units, usually difficult to obtain in a packaged boiler, are nothing unusual for Union Iron Works. Superheaters, of the pendant or drainable type, with or without control, can be installed to meet total temperature requirements. Union heat recovery equipment, both air heaters and economizers, are readily supplied when needed.

The MH Steam Generator is also designed so that it may be easily converted to stoker firing. There are no floor tubes to be removed nor any changes required in pressure parts.

FEATURES SYMMETRICAL, STRUCTURALLY SOUND DESIGN

Many of the prime advantages of Union's Type MH Steam Generator are readily traceable to the unit's 3-drum design which features divided tube banks and tangent tube wall construction.

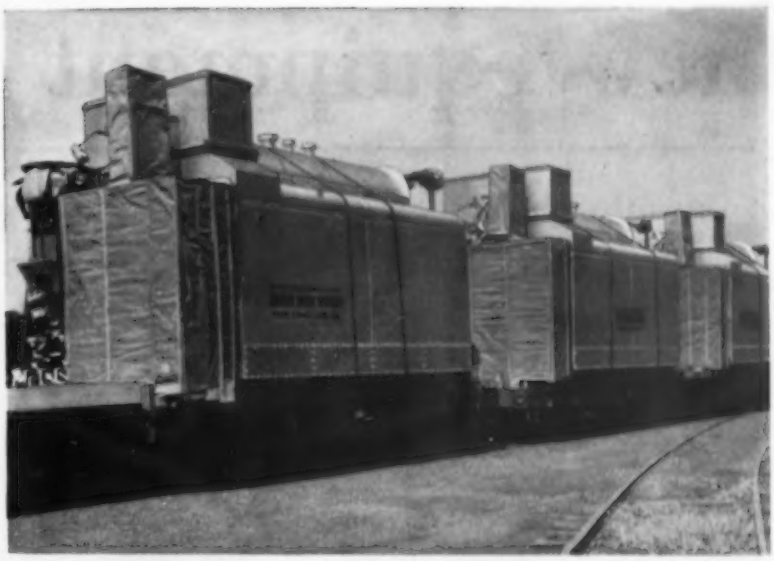
The divided tube banks enclose a self-contained furnace and provide multiple tube rows between the furnace and casing walls. This arrangement and the use of tangent tubes in both outer rows brings about minimum radiation losses and low casing temperatures without heavy refractory wall construction.

HIGH MASS GAS FLOW

The straight through gas flow over the divided tube banks requires furnace baffles only. The tube pattern provides high heat transfer and low exit temperatures without the higher draft losses of a staggered tube arrangement.

RAPID CIRCULATION

There are no long furnace floor tubes, water wall headers nor circulator connections to impede circulation. The MH Steam Generator can be brought on the line quickly and can carry high overloads.

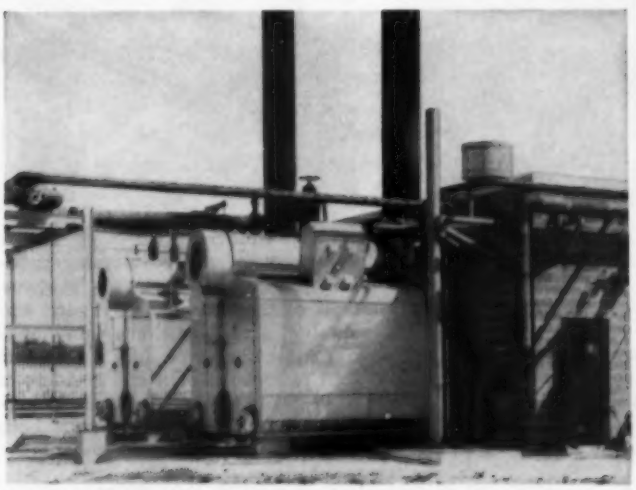


VIA RAIL OR TRUCK — Completely assembled including fuel burning equipment, combustion controls and forced draft fan, Union Type MH Generators are shipped to arrive on-location ready for immediate service.

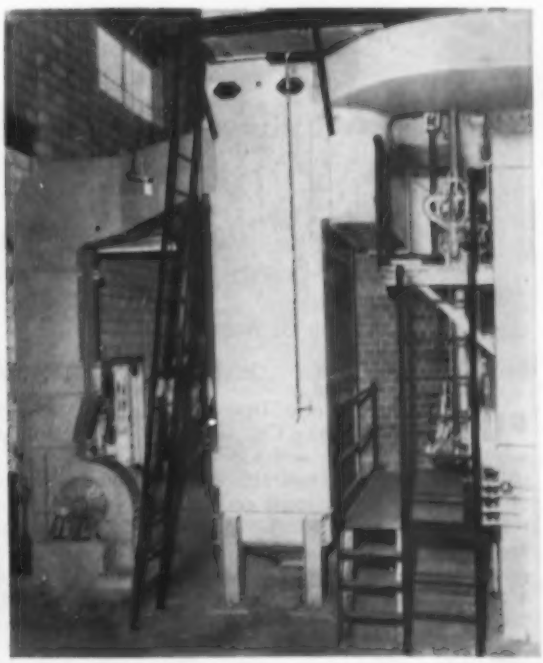
FULLY DESCRIBED IN ILLUSTRATED, 16-PG. BULLETIN

Recently published by Union Iron Works, a colorful bulletin gives a full description of MH Steam Generators and includes: cut-away illustrations, installation photos, tube arrangement layouts, a photo sequence story of shop assembly construction and a dimension table for all standard units. Copies of Bulletin MH 3-54 may be obtained without charge by writing to Union Iron Works, Erie, Pa. 1565 Cascade Street

Generators erected designs



ADAPTABILITY PROVED OUTDOORS — Two Union Type MH Packaged Steam Generators serve a chemical processing plant. Each of these gas fired units has a capacity of 18,000 lbs. per hour at 250 psi.



EQUIPPED FOR HEAT RECOVERY — Serving a large printing plant, this oil fired Type MH Packaged Unit is equipped with a forced draft package air heater for 85.79 efficiency.

Circle 505 on Reply Card for more data

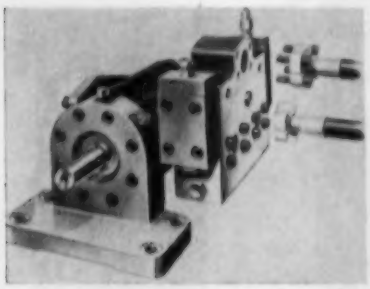
new equipment

. . . new developments

D10 CONDENSER CLEANER — The air or water operated Bio-Gun cleaner, being introduced by Thomas C. Wilson, Inc., can be used for removing soft deposits such as mud and algae from condensers in steam power plants and in refrigeration, air-conditioning, and process industries. Plug and brush projectiles are furnished with outside diameters in the range between ½ and 1 in. User may select corded-rubber plug or nylon spiral brush.

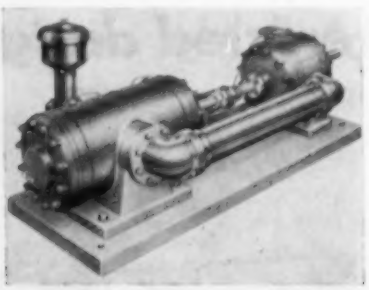
D12 POWER TRANSMISSION — Dodge Mfg. Corp. announces the Flexidyne, an industrial power transmission for handling difficult starting and reversing problems. The unit assures accurate overload protection since it can be set to slip at anywhere from as low as 20 percent over full load torque to as high as peak motor torque. It produces constant torque for a given input speed, regardless of percentage of slip between the rotor and housing.

D14 INSULATION introduced by Insul-Mastic Corp. of America is in the form of a resinous liquid that is sprayed like paint but foams to 20 times its original thickness. Known as Poly-Cell, it can be installed wherever a spray gun can be pointed and will adhere to practically any type of clean surface, either dry or moist. The material has been tested successfully at temperatures from –40 to 225 F. It will not support combustion.



D11 PUMPS — Dudco Div., New York Air Brake Co., is now offering its PF-100 series of 2000 psi variable delivery hydraulic power units as double pumps equipped with integral valve panels. The integral units may be used to supply power to two separate systems or to a single two-pressure circuit. Total pump capacity range 6 to 22 gpm.

D13 FLEXIBLE SHAFT machine announced by Stow Mfg. Co. can be used with grinding wheels, buffing wheels, sanding discs and drums, wire brushes, and drills. Known as the V-40, the machine can be operated at 1725, 2700, 4450, and 6900 rpm and is furnished with a 6 ft shaft. Speed can be changed easily with an eccentric countershaft.



D15 PUMPS — Two-stage 100 lb rotary air compressor/vacuum pumps for shop air systems, drill rigs, pneumatic conveyors, and similar applications are announced by Allis-Chalmers Mfg. Co. The unit is water cooled and consists of a separate low pressure unit coupled to a high pressure unit both mounted on a common bed plate.

NOTE—Each new product item has a key number for your convenience in asking for additional, detailed information. Circle this number on Reply Card, pages 34/35 & 74/75.

BETZ • *A Great Name In Water Conditioning*

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Big things are happening daily in industrial water conditioning . . . new developments . . . new discoveries . . . new techniques. As the leader in researching better ways to condition water, Betz is far out in front. The record speaks for itself. For example, Betz was

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. . . *first* to develop an economical technique for the control of corrosion and pitting in recirculating cooling water systems.

. . . *first* to pioneer the use of effective antifoam agents for prevention of carryover.

. . . *first* to develop a practical method of silica removal from boiler feedwater.

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CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

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DEARBORN CHEMICAL COMPANY • MERCHANDISE MART PLAZA • CHICAGO 54, ILL.

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☐ Have a Dearborn Water Treatment Engineer call

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*.....*State*.....

Circle 507 on Reply Card for more data

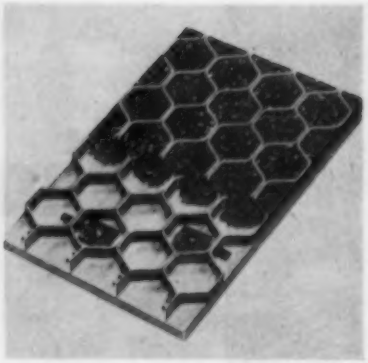
new equipment

—Starts on page 10

D16 BUS DUCT with aluminum bus bars is now available from Westinghouse Electric Corporation's Standard Control Div. The duct, 35 percent lighter overall than its copper counterpart, is available in ratings of 225 amp through 4000 amp.

TO GET MORE INFORMATION
Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.

D19 DEMINERALIZER — For production of small quantities of pure water a portable mixed-bed demineralizer, the Model MBD-6A, has been developed by the Permutit Co. The units have a capacity of about 1500 grains total dissolved solids and require 110 v 60 cycle current supply.

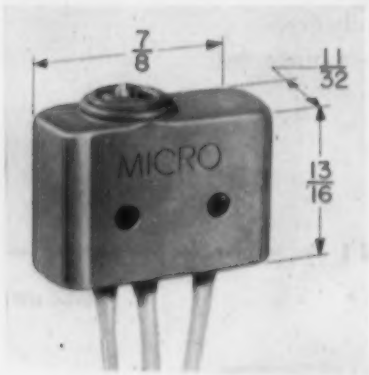


D22 SAFETY FLOOR ARMOR announced by Klemp Metal Grating Corp. has less weight per sq ft and greater exposed steel surface than former types. Known as Hexteel, the armor can be filled with hot or cold mastic for resurfacing existing concrete or wood floors and can be used as armor in new floors.

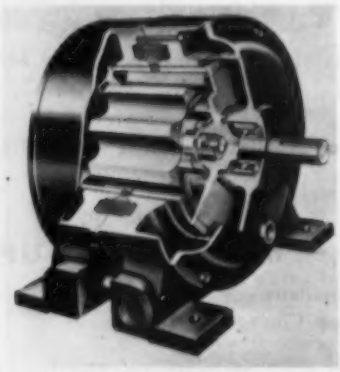
D17 MULTIPORT RELIEF valves with cushion multiple valve disc construction are designed to provide safe, smooth relief of overpressure in systems or equipment, and to eliminate waste of steam, air, or gas by over-relief. Developed by Cochrane Corp., the valves are made in sizes 4 to 48 in. in vertical up-flow, horizontal, or angle types corresponding to over-all set pressure ranges 0-25, 0-60, 0-100 psig.

D20 INSULATION TAPE announced by Minnesota Mining & Mfg. Co. features an improved pressure-sensitive adhesive that sticks tight on contact with 50 percent more "grab" than its predecessor. Known as Scotch brand electrical tape No. 39, its adhesive forms a permanent, solvent-resistant bond after curing. Thinner than former tapes it is more useful where space is at a premium.

D23 THE SPRAY COATING announced by the Tar Products Div. of Koppers Co., Inc. provides protection from corrosion with a moderate degree of insulation for metal equipment. Developed for use in locations where metal tanks containing heated materials require corrosion proof protection as well as insulation to prevent major heat losses, it may be used where massive insulation is not necessary.



D18 SNAP-ACTION SWITCH — The completely sealed, subminiature switch available from Micro Switch Div. of Minneapolis-Honeywell Regulator Co. gives trouble-free operation in temperatures from –65 to 180 F. Known as the ISEI, the switch is designed for applications where small size, lightweight, and environment-proof construction are required.



D21 ADJUSTABLE SPEED drive, the Dynaspede Coupling, developed by Dynamatic Div., Eaton Mfg. Co., is a stationary sealed, liquid cooled, eddy-current transmission device. Absence of all rotating electrical components is said to provide superior performance with reduced maintenance and ready adaptability to hazardous, moist, dirty, and other adverse locations.

D24 PACKLESS VALVE — The direct lift, solenoid-operated, packless valve, available from Automatic Switch Co., is designed for low pressure applications up to 7 psi. Known as the Bulletin 8030-A valve, it features simple construction and operation to permit easy maintenance of internal parts without removing valve from pipe line. It comes in ⅜ and ½ in. pipe sizes.

Keeping it SIMPLE

HAMMEL-DAHL MAKES THE SAUNDERS VALVE AUTOMATIC —MAINTAINING ITS BASIC SIMPLICITY and LOW COST

Superstructure

- H-D *ALLSTEEL* SECURELY FASTENED TO BODY
- AIR-TO-CLOSE
- AIR-TO-OPEN
- PRELOAD (SPRINGLESS) THROTTLING CONTROL
- DUPLEX (SPRINGLESS) ON-OFF CONTROL

Body

- SCREWED AND FLANGED ENDS
- GRINNELL OR HILLS-McCANNA
- WIDE VARIETY OF MATERIALS FOR BODY, LINING, AND DIAPHRAGM
- SIZES ½" — 10"

COMPLETE Information in Bulletin 108

HAMMEL-DAHL COMPANY

175 POST ROAD, (WARWICK) PROVIDENCE 5, R. I., U. S. A.

SALES OFFICES IN ALL PRINCIPAL CITIES

MANUFACTURING PLANTS IN WARWICK, R. I., U. S. A., CANADA, ENGLAND, FRANCE AND HOLLAND

CANADIAN MANUFACTURING AFFILIATE—GUELPH ENGINEERING CO., GUELPH, ONT.

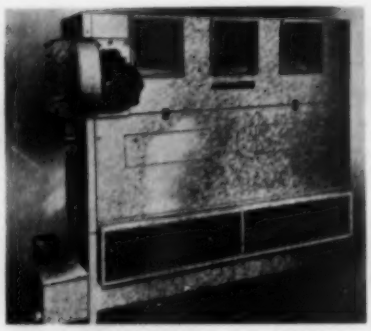
Circle 508 on Reply Card for more data

new equipment

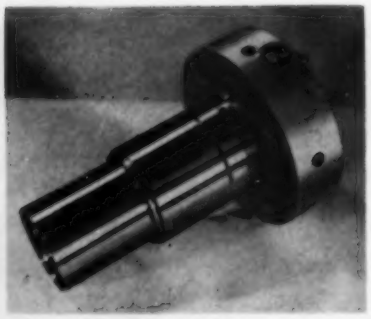
—Starts on page 10

D25 TOTALLY-ENCLOSED motors conforming to the new NEMA standards are now available from U. S. Electrical Motors, Inc. Designated Type J, the motors are in ratings from 1 to 10 hp and are also available in the fanless type for lower ratings from 1 to 1½ hp.

TO REQUEST ADDITIONAL DATA
Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.

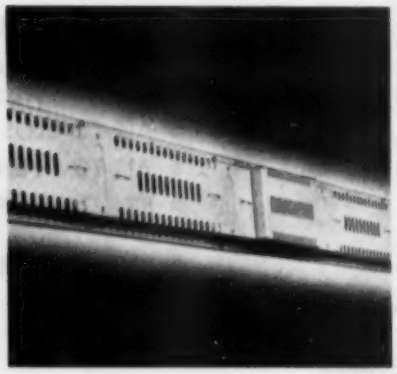


D28 COOLING TOWERS, known as the Flow-Mizer line, with capacities from 15 through 100 tons at 75 F wet bulb and a water saving efficiency up to 97 percent, are announced by Acme Industries. Centrifugal blowers are used to induce constant velocity air flow with ample capacity for use with duct work.



D31 MECHANICAL SEALS for high pressure boiler feed pumps, introduced by Byron Jackson Co., stop liquid loss, reduce heat loss, and require no operating adjustment. The seals have been tested successfully in a number of high pressure, hot water pumping operations at temperatures up to 430 F.

D26 CHEMICAL FEED control apparatus announced by Graver Water Conditioning Co. is a packaged unit combining precise control with an accurate liquid level alarm. It can be used to regulate flow in any situation in which it is necessary to feed liquid chemicals as in direct boiler feed and for processing purposes. The total time cycle, feed and non-feeding time, can be set to proceed automatically until chemical supply is exhausted.



D29 LOW VOLTAGE BUS systems known as Uni-Bus feature new concepts in flexibility, safety, and efficiency for distribution of electric power in industrial and commercial construction, according to the manufacturer Roller-Smith Corp. Available in ratings from 225 to 775 amp, 600 v, 2, 3, and 4 pole types, the system incorporates a duo circuit arrangement that offers low reactance characteristics for both feeder and plug-in types of bus.

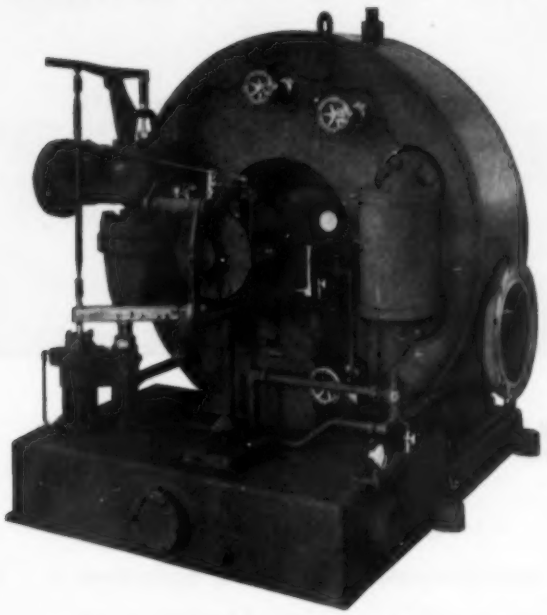
D32 STEEL VALVES — Improved internal streamlining, which lessens wear and reduces pressure drop, is featured in the redesigned 600 lb line of Rockwell-Built Edward globe and angle stop, check, and non-return cast steel valves announced by Edward Valves, Inc. In sizes 8 in. and larger, the units have the improved pressure-seal bonnet joint which gives twice as much sealing force and three times as much sealing area.

D27 SIGHT FLOW indicators made by Jerguson Gage & Valve Co. for viewing liquid flow can be installed in any new or existing pipe line ½ to 2 in. NPT. Units are available in transparent two-window and one-window, and reflex one-window types. Solid Wedge Type Illuminators are available for use with the flow indicators in either explosion-proof or standard models.

D30 COATING — Amercoat Corp. has developed a vinyl mastic protective coating known as Amercoat No. 87 which can be applied at a thickness of 10 mills in one double-pass spray coat. The dense, impermeable protective film does not flow away from edges and sharp corners and therefore provides extra protection for areas particularly susceptible to corrosive attack.

D33 CONDUIT—Electrical metallic tubing with a "Silver" inside finish, said to make wire pulling easier, is introduced by Triangle Conduit & Cable Co., Inc. The finish also protects the inside of the tubing against corrosion and rust. Outside of Triangle E.M.T. is galvanized with zinc. Inside finish is a hard, glossy coat which makes a smooth raceway without "tackiness."

TROUBLE-FREE TURBINE OPERATION STARTS HERE



Terry solid wheel turbines have become a symbol for dependable, trouble-free operation. The reason—simplicity and ruggedness of construction.

Take the rotor, for instance. It's a solid forging in which a series of semi-circular buckets is milled. There are no separate parts to loosen or work out. Since the only function of the blades is to form a series of pockets, any wear which might occur would not materially affect horsepower or efficiency.

It is impossible for the blades to foul. They have large clearances and are further protected by the projecting rims at the sides of the wheel. As the side clearances are also very large, end play can do no harm.

Simplicity outside too—as you can see from the photograph of the 1500 HP at 3500 RPM solid wheel turbine above. This turbine is equipped with an oil relay governor and forced feed lubrication to the bearings.

For more about these *work horses of industry*, send for a copy of bulletin S-116. No cost or obligation.

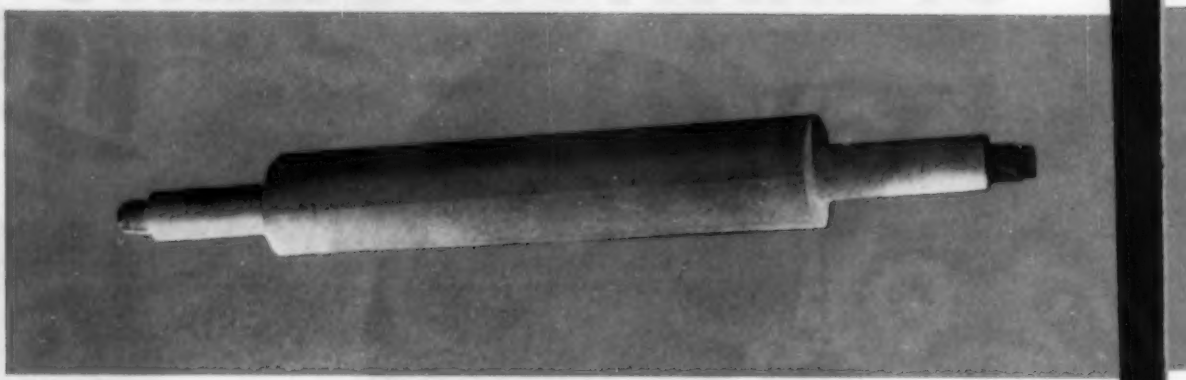
THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

TT-1200

Circle 509 on Reply Card for more data

Minimize Costly Delays



Rubber Covered Rolls . . .

for
- *paper mills*
- *steel mills*
- *food processing plants*
- *textile finishing*
- *process industries*

Where a quality job is important — and quick delivery is essential.

Vail can keep your plant running more days because "Rush Delivery" is our standard practice.

Vail is equipped to apply natural or synthetic rubber coating 1/8 in. to 3 in. thick on cores 1 in. to 34 in. O. D.

Vail does custom coating to your specifications for temperature, chemical resistance, and hardness.

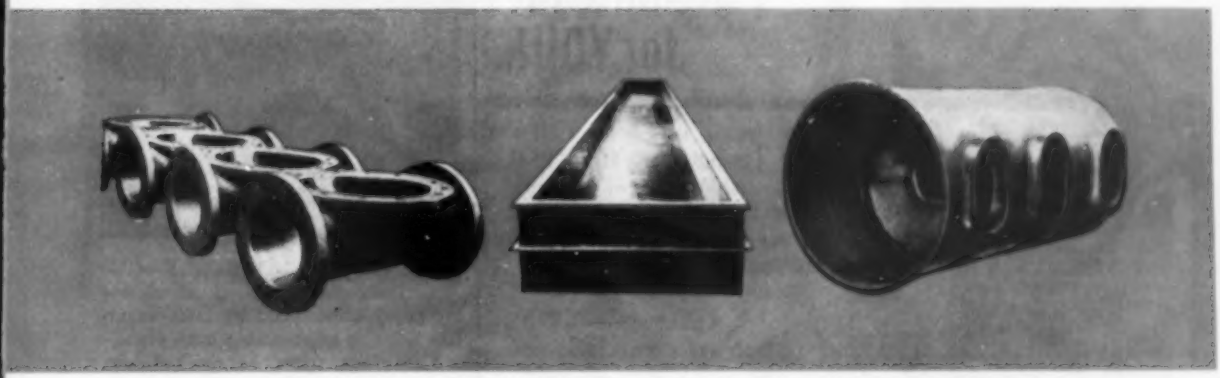
for
- *custom quality*
- *quick delivery*
- *special specifications*

VAIL RUBBER WORKS, Inc.

ST. JOSEPH, MICHIGAN

Circle 509 on Reply Card for more data

and Output Losses



. . . Rubber Lined Equipment

for

- *protection against corrosion*
- *avoiding product contamination*
- *economical handling of abrasives*

The tested answer is a rubber lining, natural or synthetic, engineered to your specifications. Vail can "Rubber Rate" the job to meet your particular needs.

Custom Engineered Linings

for

- *tanks*
- *vats*
- *piping*
- *valves*
- *special process equipment*

VAIL RUBBER PRODUCTS Corp.

Subsidiary of Vail Rubber Works, Inc., St. Joseph, Mich.

Calumet Division • 1814 Summer Street • Hammond, Indiana

Circle 510 on Reply Card for more data

HYDRO-FLEX --- we engineered this new steam trap for YOU!

☐ Install Strong Hydro-Flex steam traps with assured confidence. This completely new line of low, medium, and high pressure steam traps will operate equally well on light and heavy condensate loads.

Hydro-Flex offers these outstanding features and more:

- greater discharge capacity and efficient operation under *all* conditions
- dual fulcrum arrangement that snaps the leak-free valve wide open to give unrestricted condensate flow
- all working parts and deep-drawn bucket of durable stainless steel.
- rugged construction features assure long trouble-free service.

For complete information, contact your local Strong Distributor and write for new Bulletin No. SS-40A.

STRONG, CARLISLE & HAMMOND CO.
1382 W. 3RD. STREET
CLEVELAND 13, OHIO

STRONG®
HYDRO-FLEX
high efficiency under all condensate loads
STEAM TRAPS

Available from over 200 industrial distributors in the United States, Canada and Foreign Countries.

BOTTOM INLET SERIES
Hydro-flex traps with bottom inlet have the same high qualities and features as horizontal types.

PRESSURE REGULATING VALVES
3 types available for wide range application . . . to meet pressure and capacity requirements.

BLAST TRAPS
Thermal types for quick air and condensate removal during rapid heating up.

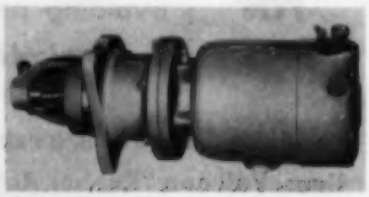
STRONG STRAINERS
Offer maximum protection from dirt, scale or sediment. Available in semi steel, cast steel and bronze.

Circle 511 on Reply Card for more data

new equipment

—Starts on page 10

D34 TIME DELAY RELAY—The silicone-controlled time delay relay announced by Heinemann Electric Co. is available with standard timings from ¼ to 120 sec. Known as the Type Silic-O-Netic Relay, the unit has been designed with a considerably increased magneto-motive force and with a specially spring loaded armature to achieve high speed contact action.



D35 STARTING MOTOR, known as the Size 5 BM, is designed for starting service on gasoline engines from 750 to 1750 cu in. displacement and for diesel engines from 300 to 700 cu in. displacement. Manufactured by Ingersoll-Rand Co., the motors feature bearings sealed to keep grease in and dirt out and are smaller and more compact than equivalent electric starters.

D36 PIPE THREADER—A new accessory for the Port-A-Pony Portable power pipe threader,

Circle 510 on Reply Card for more data

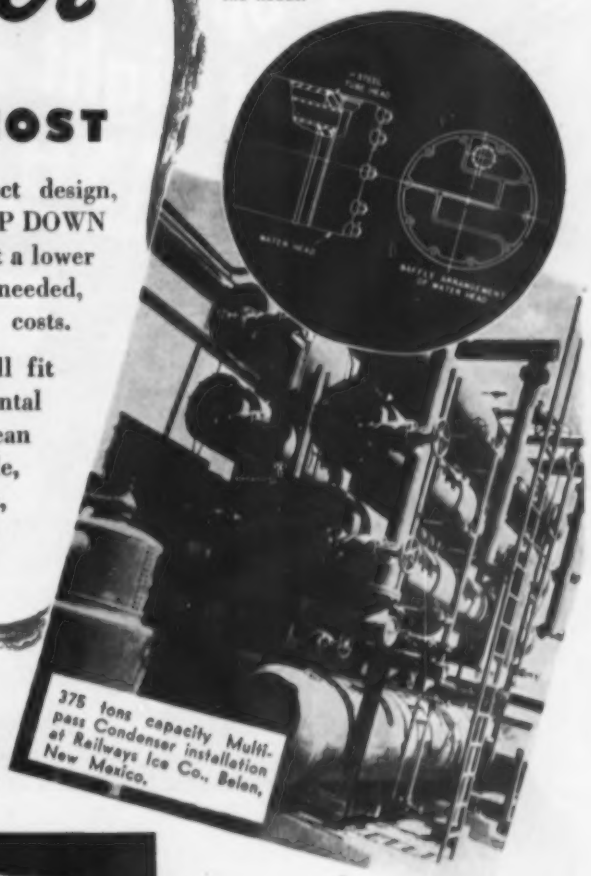
$ave Power and REFRIGERATION COST

Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

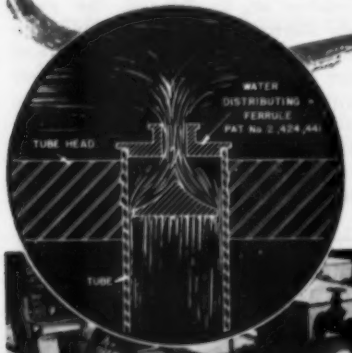
One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers
(Closed Type)

Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

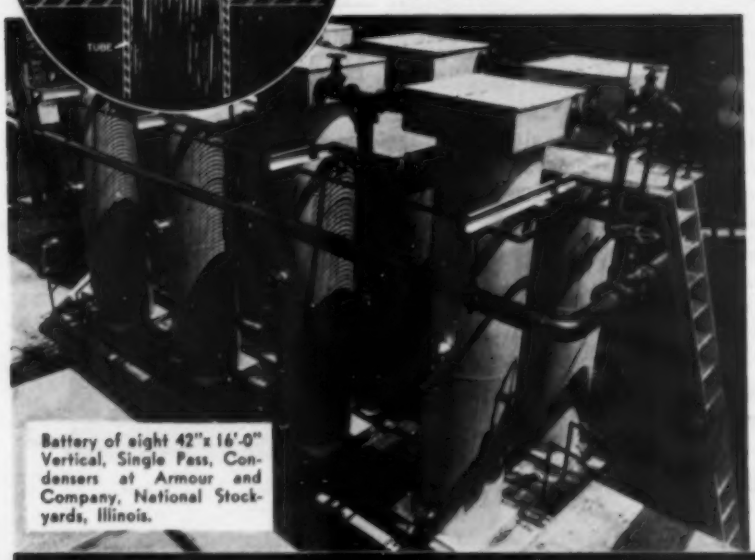


375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.



Vertical Single Pass Condensers
(Film Type)

Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

HORIZONTAL and VERTICAL TYPES SHELL and TUBE CONDENSERS For Every Service

Write For Bulletin RC-2

HENRY VOGT MACHINE COMPANY
INCORPORATED
1000 W. ORMSBY ST., LOUISVILLE 10, KY., U.S.A.
Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

Vogt REFRIGERATION CONDENSERS

Circle 512 on Reply Card for more data

wide open . . . or shut tight — in a FLASH!

It takes less than a quarter turn to open an Everlasting Valve *wide* or close it *tight*. That's one of the many reasons why these time-proven valves are so popular wherever quick valve action is desired . . . on equipment outlets, storage and measuring tanks, process lines, boiler blow-offs, spray lines, meter testing, etc.

Write for Bulletin E160 describing their many other important advantages and with full information on types, sizes, etc.

For "everlasting" service, use

EVERLASTING Valves

EVERLASTING VALVE CO.
41 FISK STREET, JERSEY CITY 5, N. J.

EVS89

Circle 513 on Reply Card for more data

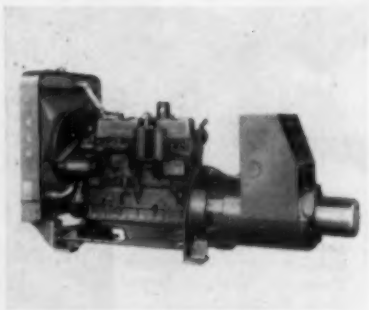
new equipment

—Starts on page 10

a 12 lb pipe cutter which power cuts ½ to 2 in. pipe in 30 sec, includes a safety guide which prevents gouging and burring. One set of cutting knives is included with the unit and grooving and beveling knives are available. Thread-Ezy Mfg. Co.

D37 GAGE COCK — Designed for pressures up to 450 psi, the gage cock announced by Reliance Gauge Column Co. operates by chains and lever to rotate a multiple thread (quick-closing) stem. The steel operating lever has an internal sprocket arrangement giving choice of 18 non-slipping positions for selection of best lever location.

TO REQUEST ADDITIONAL DATA
Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.



D38 GENERATING PLANT—The 75,000 w electric generating plant announced by D. W. Onan & Sons, Inc. has been specially designed to provide excellent electric motor starting for plants where interruption of electric power would re-

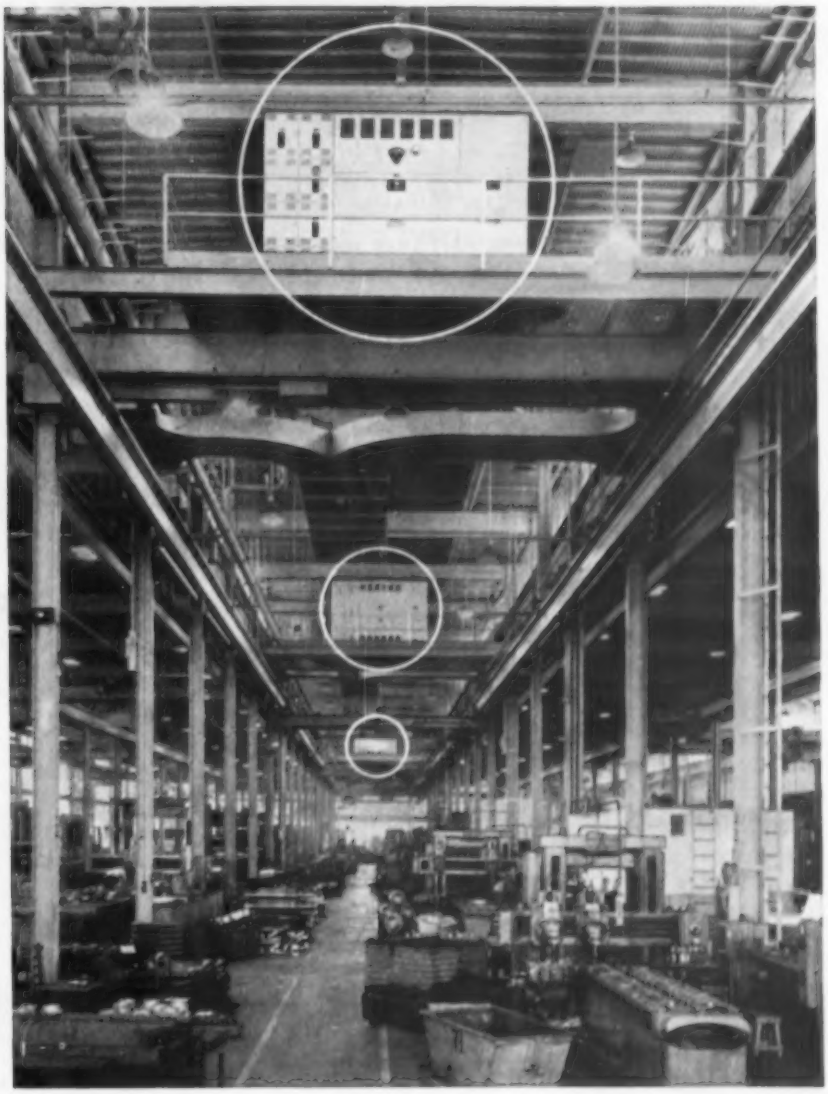
This is how

THE GOSS PRINTING PRESS CO., Chicago obtains

efficient distribution

of electric power with high voltage feeders to load centers, and also

saves floor space



This was accomplished with

SORGEL Dry-Type Transformers,

compactly incorporated into substations, all self-contained, safely enclosed in steel, complete with primary switchgear and secondary circuit breakers, and installed above floor level.

This installation consists of five 500 Kva and two 300 Kva, 3-phase, 4160 volt to 480 volt substations for power, and 13 dry-type transformers, sizes 10 to 50 Kva, 3-phase, 480 volt to 120/208 volt for lighting and portable equipment.

This installation saved The Goss Printing Press Co. thousands of dollars over a low voltage distribution system, and provided them with the efficiency that only a high voltage distribution can provide.

Again the ingenuity of an owner, his architects, and consulting engineers, combined with SORGEL expert engineering, resulted in a most modern, flexible, space-saving and efficient electric distribution system.

By using SORGEL dry-type substations, all vaults have been eliminated, and by installing the substations overhead, more floor area was made available for manufacturing facilities.

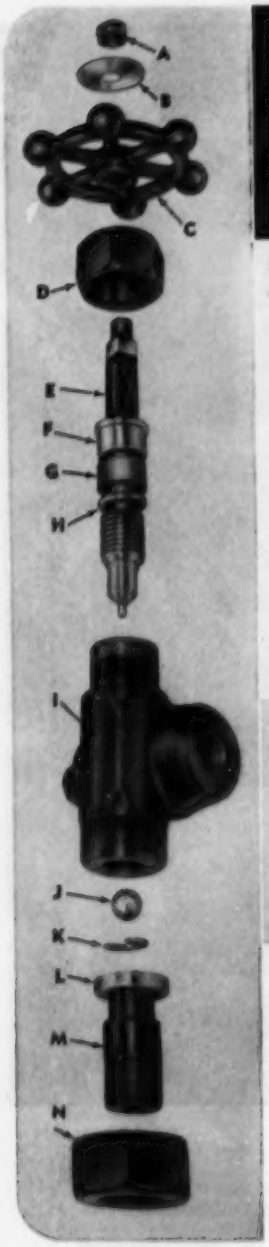
Architects — Olsen & Urbain
Engineers — Neiler, Rich & Bladen
Electrical Contractor—The Edward Electric Co.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 841 West National Ave., Milwaukee 4, Wis.

40 years experience in the development, manufacturing and application of transformers

Circle 514 on Reply Card for more data



HERE'S WHY

PENBERTHY

GAGE VALVES

ARE YOUR BEST BUY!

Long, Trouble-Free Service Built-In

PENBERTHY TYPE 300 STANDARD LIQUID LEVEL GAGE VALVE "DU-LUX" BLACK ENAMEL FINISH

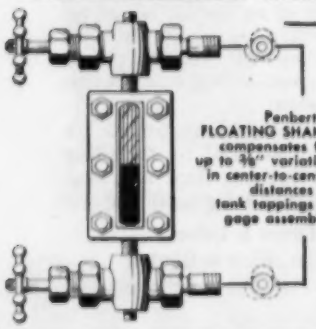
A Steel Locknut
B Identification Plate
C Steel Wheel or Lever
D Steel Stem Packing Nut
E Stainless Steel Standard or Quick-Closing Stem
F Stainless Steel Packing Gland
G High Temperature Resisting Stem Packing
H Stainless Steel Stem Packing Retainer
I Forged Steel Body
J Stainless Steel Ball
K Stainless Steel Ball Retainer
L Patented "Floating Shank"
M Steel Tailpipe
N Steel Coupling Nut

UNION GAGE CONNECTION models permit removal of gage without disturbing valves or draining system.

PLUS... AT NO EXTRA COST... EXCLUSIVE FLOATING SHANK

No other gage valve has all of the quality features of a Penberthy. Features that add up to top performance at lowest cost. You can see that for yourself in the "exploded" view of a Penberthy valve.

In addition, the FLOATING SHANK is a time and labor saving feature that cuts installation and replacement costs by 50% or more. It also eliminates strain, caused by a forced installation, with its subsequent danger to the entire installation.



Penberthy FLOATING SHANK compensates for up to ¾" variation in center-to-center distances of tank toppings or gage assembly.

Try Penberthy Gage Valves on your next installation. See for yourself why they are your best buy. Obtain them through your local supplier or direct. WRITE for Catalog No. 35 showing the complete line . . .

PENBERTHY INJECTOR COMPANY

Division of the Buffalo-Eclipse Corporation

1242 HOLDEN AVENUE • DETROIT 2, MICHIGAN

- GAGES
- EJECTORS
- EDUCTORS
- EXHAUSTERS
- SYPHONS
- ELECTRIC SUMP PUMPS
- CYCLING JET PUMPS
- INJECTORS

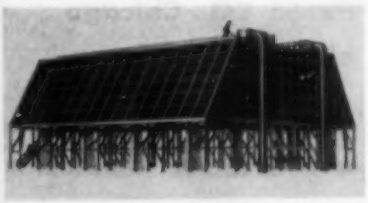
There's Certain Satisfaction in Products by PENBERTHY

Circle 515 on Reply Card for more data

new equipment

—Starts on page 10

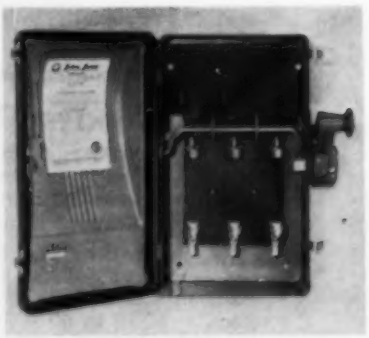
sult in costly production losses. Designated Model 75HR, the gasoline-engine-driven units will produce either 75,000 w of 60-cycle, ac at 1800 rpm engine speed or 60,000 w of 50-cycle, ac at 1500 rpm engine speed.



D39 COOLING TOWER — Santa Fe Tank & Tower Co. announces the Wind-trol, a cooling tower which is said to offer the advantages of improved operating efficiency by controlling recirculation and increased functional life span with reduced maintenance requirements. Mounted on an open substructure, the tower and its redwood basin are supported by "cast-in-place" concrete.

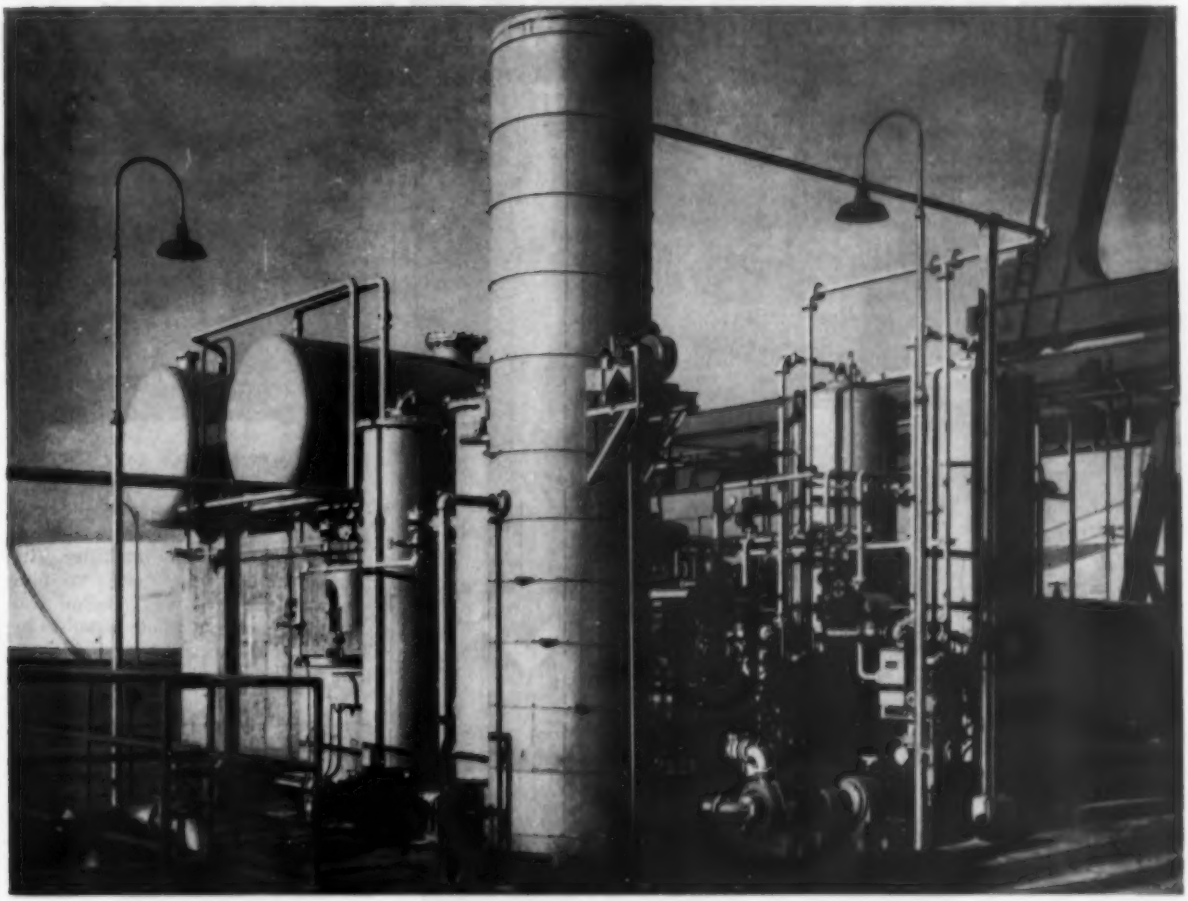
TO REQUEST FREE BULLETINS

Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.



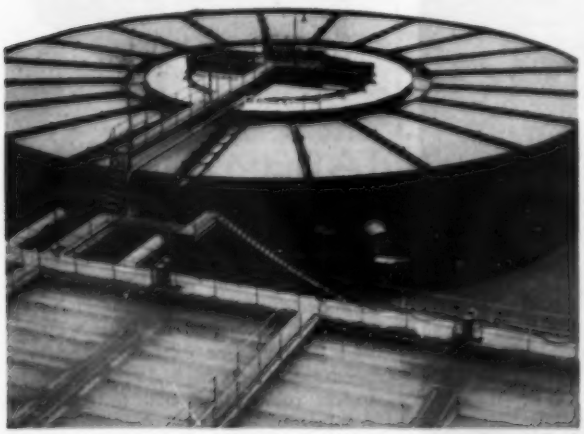
D40 SAFETY SWITCH — For heavy duty industrial use, Westinghouse Electric Corp. announces the Type H safety switch with a dust-resisting enclosure and Micarta laminated plastic shields over the line terminals. The switch is available in ratings from 30 to 1200 amp, 600 v and below.

3 SOLUTIONS FOR YOUR BOILER FEEDWATER PROBLEMS



1. CATEXER® and ANEXER® Demineralizing Plants: Pioneered by INFILCO, these demineralizing and silica removal plants, operating on the ion exchange principle, provide the low solids and low silica content water so necessary to the satisfactory operation of very high pressure boilers and turbines. They afford five major advantages: (1) improved make-up quality, (2) adequate make-up supply regardless of station electrical load, (3) reduced overall operating costs, (4) lowered maintenance costs and (5) lower labor costs.

2. ACCELATOR® Treating Plants: The "ACCELATOR" treating plant with appropriate chemical feeding equipment and auxiliaries affords in many cases a satisfactory means of treating feedwater for low pressure boilers or for pretreating feedwater for higher pressure boilers. They have a proven record of flexibility, ease of operation and chemical economy.



3. Hot Process Softeners: For the intermediate range of boiler pressures, INFILCO Hot Process Softeners with Hot Process Zeolite Units provide low alkalinity, low hardness and low silica content feedwater at moderate chemical cost.

Engineering Experience: Complete engineering know-how plus many years of experience has made INFILCO the leader in its field. Our field engineers are available to suggest practical solutions for your feedwater problems. Write today for complete information to

INFILCO INC.
911 South Campbell Ave.
Tucson, Arizona
Field offices in principal cities in North America

INFILCO

The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

Circle 516 on Reply Card for more data

the best circuit breaker safety switch costs no more

You would expect to pay *much* more for this Heinemann 100 Ampere Safety Switch.

It's easier to install, more convenient to use. After trouble is cleared from the line, a flip of the handle restores service instantly. There's no hunting for fuses . . . no waiting to reset. Heinemann circuit breakers operate hydraulic-magnetically . . . permit safe use of the full capacity of your wiring at any temperature, without de-rating or the extra cost of larger switches. Inverse time delay allows necessary starting currents, prevents false-alarm tripping.

It's less than half the size and half the weight of comparably rated fused switches.

Yet, with all this extra value, the Heinemann Safety Switch costs no more. For descriptive literature, request Bulletin 1411.

ORDER NOW

For 120/240 volts AC, 3 wire; 120 volts AC 2 wire with insulated groundable neutral.

Cat. No. H-9002-70 enclosure with 70 amp. circuit breakers.

Cat. No. H-9002-100 enclosure with 100 amp. circuit breakers.

HEINEMANN ELECTRIC COMPANY

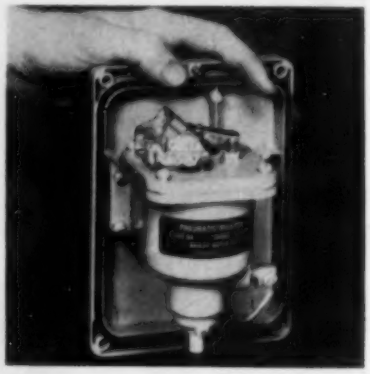
140 Plum Street, Trenton 2, N. J.

Circuit Breakers

Circle 517 on Reply Card for more data

new equipment

—Starts on page 10



D41 PNEUMATIC RECEIVER, available from Bailey Meter Co., features unlimited record grouping, shelf-to-operation simplicity, and drift-free stability. Arbitrary mounting of one to four identical units in any Bailey Receiver Recorder is made possible by plug-in, pin-positioned construction and an indexed drive arm.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.

D42 TELEVISION SYSTEMS—Radio Corporation of America announces a new closed-circuit television system for more exacting "heavy duty" industrial applications. It is designed for use under such adverse conditions as shock, vibration, and temperature extremes and reproduces sharp, high-definition television pictures of 550 to 600 line resolution.

SO YOU HAVE TO BUY A BOILER!

Select an AMESTEAM GENERATOR and solve all your problems

You don't have to dig through mountains of data to pick the boiler that will give your company the most economical and satisfactory service! It's more a question of *where* you buy it than what boiler you choose. What's the maker's reputation?

Ames Iron Works have been building boilers of quality for over 100 years. Back of every Amesteam Generator is this long, successful experience — represented by the Ames Engineering Staff, a large group of skilled boiler makers and an efficient, nation-wide sales and service organization at your disposal. Yes, quality and experience *do* count — and the thousands of Amesteam Generators giving dependable, low-cost service in power, process and heating applications are proof of it. Why not be *sure* by specifying Amesteam Generator? Write today for details and name of your Ames representative.

AMESTEAM GENERATOR

- 80% guaranteed thermal efficiency.
- Single economical package purchase.
- Package installation economy.
- Completely safeguarded.
- Easy, inexpensive maintenance.
- 20 sizes, 10 to 600 H.P., 15 to 200# W.P., oil, gas or oil-gas combinations with quick fuel switchover feature.

AMES IRON WORKS, INC.
BOX F-45, OSWEGO, N. Y.

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new bulletins

. . . catalogs from leading manufacturers

200—Control Valves

A complete line of precision controlled valves, for high and low pressures and wide ranges of temperature, are presented in four-page folder 5417. The booklet points out that most gases and fluids can be handled with the same valve design by a change of pilot valves. C.E. Squires Co.

201—Surface Heating

"Handy Selector Guide for Surface Heating," four-page folder GEA-6146, shows which type of heater to use for specific jobs, how to determine heater rating, how to calculate heat-up time, and how to select thermostats. General Electric Co.

202—Cooling Tower

Four-page bulletin 5.1.902 describes the LoLine, an all-new cooling tower specifically designed for air conditioning applications — with the lowest silhouette of any tower of 75 ton capacity or larger. Each component of the tower is discussed separately and a typical cross-sectional drawing shows operation. J. F. Pritchard & Co.

203—Jet Equipment

"SK Jet Apparatus and Its Industrial Applications," ten-page bulletin J-1, includes basic information on the jet principle, jet apparatus terminology, and data on jet construction, operation, and advantages. Functions performed by jet apparatus are outlined, types best suited for each function are identified and described. Schutte and Koerting Co.

204—Solid Shaft Motors

Improved types of U. S. vertical solid shaft motors, including Unimount motors in ratings from ¼ to 400 hp in grease and oil lubricated types and U. S. footless type horizontal motors for direct connection, are illustrated and described in bulletin 1868. U. S. Electrical Motors Inc.

205—Automatic Weighing

Bulletin 0351, 28 pages, describes Select-O-Weigh, a development in automatic proportioning equipment that permits dialing of individual ingredient weights in a formula. Eleven installations in varied operations are shown. Richardson Scale Co.

206—Seal-less Pumps

Detailed data on the expanding line of seal-less leakproof Chempump centrifugal pumps is presented in 16-page bulletin 1010. It gives information on sizes, horsepowers, heads and capacities, dimensions, and design data. Chempump Corp.

207—Proportioning Pumps

Controlled capacity pumps and proportioning equipment for capacities from a few cc per hour to over 3300 gal per hr are covered in catalog S-1254. Types of pumps described include both simplex and duplex standard (up to 1500 psi) and low pressure (up to 800 psi). Philadelphia Pump & Machinery Co.

208—Sheet Insulation

"Marinite For Driers, Ovens, Breechings, and Housings," 16-page booklet IN-153 A, tells you how you can build and insulate with this sheet material. Handling and working recommendations, data on physical and thermal properties, and construction and fabrication suggestions are given. Johns-Manville.

209—Brakes

Standard eddy-current brakes and associated controls in both air and liquid cooled types are described in 11-page bulletin BR-1. Construction details, capacities, characteristic curves, and dimensions are listed. Dynamatic Div., Eaton Mfg. Co.

210—Combustion Controls

A factual and photographic roundup of how this company's Automatic Combustion Control systems are being used with various types of gas-fired boilers is presented in 14-page bulletin MSA-116. This booklet gives basic information about the right kind of combustion control practices for gas-fired generators. Hagan Corp.

Duct Size Calculator

This Duct Size Calculator will enable you to determine at a glance the accurate duct requirements for dust collection, gas evacuation, product reclaiming, and other similar problems. **Please send requests on company letterhead directly to the Ducon Co., Dept. IP, 147 East 2nd St., Mineola, L. I., N. Y.**

211—Protected Motors

"Check the Facts," 12-page booklet B-2401, points out 100 characteristic facts about the new line of Reliance totally-protected a-c motors. Included is a classification of points common to all Reliance a-c motors with a further breakdown of information specifically pertaining to the protected and enclosed motors. Reliance Electric & Engineering Co.

212—Boilers

Complete data and specifications on each of the models and sizes in the "S" series line of boilers are given in eight-page booklet WT-8. Units discussed range in capacity from 10,800 to 50,000 lb of steam per hr. Other power equipment made by this company is discussed briefly. Wm. Bros. Boiler & Mfg. Co.

213—Fuel Oil Preheaters

Two-page bulletin 54-79-1 explains how the use of the right fuel oil preheater can save costs by permitting use of lower grade fuel oil. Installation instructions, specifications, and capacities are listed for 2-pass and 6-pass preheaters. American District Steam Co., Inc.

214—Couplings

For hydraulic and high pressure systems two-page bulletin 240 suggests use of Snap-tite couplings. Cut-away view is used to explain operation and advantages. Snap-tite, Inc.

215—Corrosion Protection

"Protective Coatings," bulletin 7-2, devotes two pages to each of this company's standard coatings including neoprene heavy duty, extra heavy duty, styrene, chlorinated rubber, and epoxy resin based coatings. Atlas Mineral Products Co.

216—High Vacuum Pumps

Four-page bulletin V-54 provides a quick but comprehensive view of the complete line of high vacuum pumps ranging in size from a ¼ hp unit with a displacement of 2 cfm to a 40 hp unit with a displacement of 780 cfm. Construction and operating characteristics of single stage, compound, and two-stage mechanical booster types are discussed. Kinney Mfg. Div., New York Air Brake Co.

217—Liquid Receivers

"Liquid Receivers for Ammonia and Freon," 4-page bulletin LR-1, gives all the information necessary for specifying these units and includes elevation drawings to show typical installations. Henry Vogt Machine Co.

218—General Purpose Pumps

"KS Double-Suction Pumps," 4-page folder 08B8233, describes construction features of these new pumps for air conditioning and general purpose applications. Included are dimension and sizing charts. Allis-Chalmers Mfg. Co.

219—Electrical System Survey

Eight-page foldout is designed to help you make your own plant survey to determine if your power distribution is modern, adequate for expansion, and safe to operate. The booklet is arranged to allow a step-by-step survey of incoming supply, power generation, primary and secondary distribution, and d-c power. Continental Electric Equipment Co.

220—Underfeed Stokers

The latest refinements in single retort underfeed stokers are discussed in 12-page catalog SB53. Both the fluid ram and gear drive units are described in detail by means of text, elevation drawings, and cut-away views. Erie City Iron Works.

221—Handling Heavy Fuel Oils

"The Heating and Handling of Residual Fuel Oils," 8-page bulletin 1601, covers heavy fuel oils for use in burners of boilers, furnaces, and processing equipment of industrial and commercial plants and buildings. Use of Preferred Ribbon Heat for heating piping lines is explained. Preferred Utilities Mfg. Corp.

Preheating Chart

The Tempil® Preheating Chart lists the recommended preheat temperatures for 79 commonly used metals and alloys. Factors

NOTE — Each new bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 74/75.

The day J. B. learned about Ultra-Deionizers*

(*ELGIN-REFINITE'S, OF COURSE!)

Like a lot of other good engineers, J. B. had a favorite water conditioning system. He'd been coddling and nursing it along for years. Then came the day when he had to admit—with reluctance—that his poor old equipment just *couldn't* take care of the plant's exacting needs. And to make things worse, one fine morning, J. B.'s Old Reliable gave a grunt and just quit.

That was it. Operations at a standstill, people stewing all over the place, trucks hauling in distilled water to get things going again, the accounting department blowing its stack, everybody on J. B.'s neck—and J. B. fit to be tied.

Right about then, the afternoon mail brought an Elgin-Refinite catalog, and J. B. found out the details about Ultra-DeIonizers. First off, he discovered that he could be sure of water *purity:* deionized water contains less than *one ppm* solids—while even distilled water may contain as high as 10 ppm—and instead of the high water-treating costs he had been accustomed to with Old Reliable, J. B. found that deionized water could be produced for as little as 18 cents per thousand gallons.

After that, things got back in shape in a hurry. Elgin-Refinite's high-capacity Ultra-DeIonizer not only replaced Old Reliable, but there's plenty of capacity margin left over for plant expansion. If your present water conditioning system is costing you more than it should, or it is not delivering water sufficiently high in quality for most efficient operation, you'd better find out about the Ultra-DeIonizer, too. It produces water of highest chemical purity at an amazingly low cost. For complete information, ask for Bulletin 512.

For information about any of our other water conditioning equipment shown below, let us put the nearest Elgin-Refinite man in touch with you.

Elgin-Refinite • *Division of Elgin Softener Corp.* 136 N. Grove Ave., Elgin, Ill.

Representatives in Principal Cities • In Canada: G. F. Sterne & Sons, Brantford

Elgin REFINITE SINCE 1908

Water Conditioning Since 1908

ION EXCHANGERS • FILTERS • DEAERATING HEATERS • DEALKALIZERS • DEGASITORS • LIME-COAGULATION

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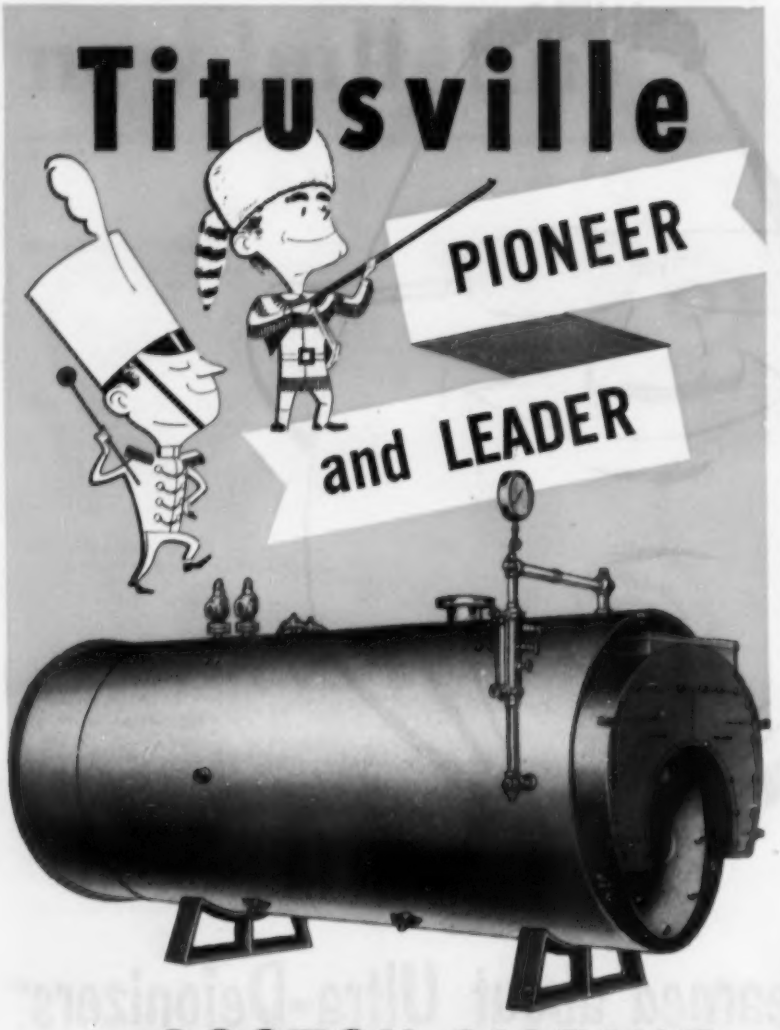

in SCOTCH MARINE
POWER BOILERS

Write for your copy of our Scotch Marine Power Boiler Bulletin B-3075A

The net to you is—A BETTER BOILER BUY! Our Scotch Marine pioneering over the years created the Titusville improvements that deliver outstanding performance for your application. Our largest-volume manufacture and sales bring you maximum dollar value in the boiler size and rating meeting your need. Let us give you the facts that tell the Titusville story!

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PA.
A division of Struthers Wells
Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

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new bulletins

—Starts on page 28

influencing temperatures and the desirable effects of correct preheating on metal properties are enumerated. **Please send requests on company letterhead directly to Tempil® Corp., Dept. IP, 132 West 22nd St., N. Y. 11, N. Y.**

222—Idlers

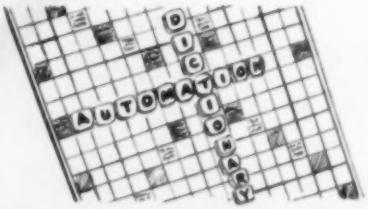
Four-page bulletin LD-103 shows how the Limberolier flexible belt conveyor idler is being used in industry for above or below ground belt conveyors handling various types of materials. Dimensions and specifications are listed. Joy Mfg. Co.

223—Gear Drives

"Parallel Shaft Gear Drives," 32-page booklet 2619, contains engineering data including simplified horsepower tables, dimensions, and overhung load capacities for selections from the standard line. Link-Belt Co.

224—Multiport Relief Valves

Three types of Multiport Relief Valves are described in 20-page catalog 5200. The booklet explains how these valves can provide maximum safety, overpressure regulation, ease of adjustment, and substantial savings. Cochrane Corp.



225—Automation Dictionary

This "Automation Dictionary" covers some 87 words and phrases in the expanding vocabulary of automation. These are not standard engineering definitions but new engineering terms defined for the average engineer. Minneapolis-Honeywell Regulator Co., Industrial Div.

226—Diesel Engines

DR Diesel Engines, as used in municipal power plants, water works, sewage treatment plants, and other industrial applications, are shown in eight-page bulletin S-500-B52B. Rating chart gives information on 5, 6, 7, and 8 cylinder engines from 550 to 2200 hp. Worthington Corp.

227—Strainers

Applications, design features, and specific operating characteristics of 15 types of strainers for high and low pressure service are given in 16-page booklet 9-S. A handy reference book for engineers, it contains dimension and sizing charts and drawings. Schutte and Koerting Co.

228—Heavy-Duty Compressors

"Horizontal Single-Stage Heavy-Duty Compressors," 20-page bulletin 201-C, describes and illustrates features of both air and gas compressors in sizes from 10 to 125 hp and for pressures up to 150 psi gage. Cross-sections show operation of unit. Pennsylvania Pump & Compressor Co.

229—Self-Contained Boilers

Four-page booklet AD-137 covers the LR and the new CB models of self-contained boilers. Suggested boiler room layout and dimensions are included with specifications on both models. Cleaver-Brooks Co.

(Continued on page 76)

New Prudential Building to burn coal the modern way

Ultra-modern in all respects, the new 41-story building of the Prudential Insurance Company of America in Chicago incorporates the latest developments in design, fixtures and construction. This beautiful structure will be completely air-conditioned and will offer its occupants all possible conveniences.

Among those conveniences will be Prudential's heating system, as up-to-date as the building itself. This most modern building in the country will burn *coal*. Cleanly. Efficiently. And its completely automatic coal handling and burning installation will provide sure, even heat *economically* under all conditions.

Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Why not talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars each year.

facts you should know about coal

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

Automatic coal and ash handling systems result in a virtually labor-free plant.

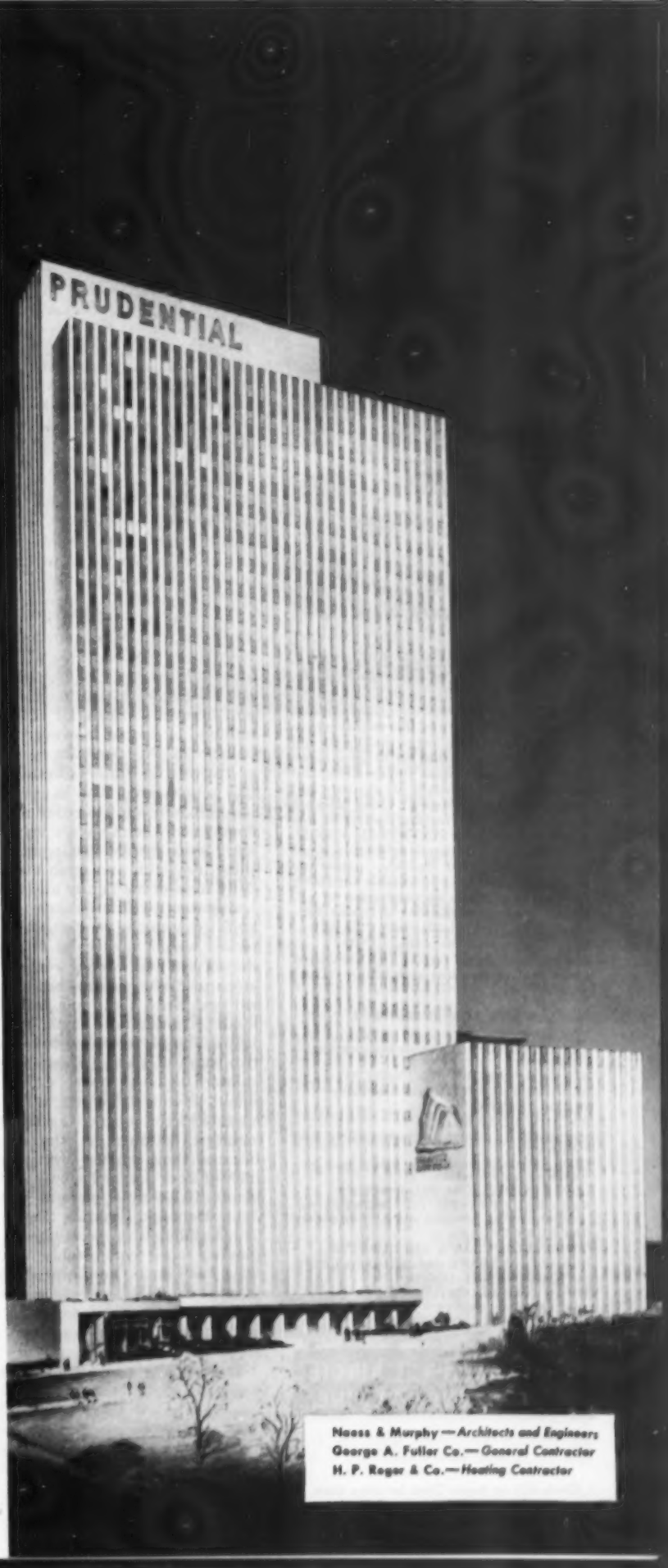
Coal is the safest fuel to store and use. No dust or smoke problems when coal is burned with modern equipment.

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D.C.



Naess & Murphy — *Architects and Engineers*
George A. Fuller Co. — *General Contractor*
H. P. Roger & Co. — *Heating Contractor*

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NATIONAL AIROIL
TYPE "SA" OIL BURNER

VIRTUALLY
IMPOSSIBLE FOR
ANYTHING TO CLOG
OR GO WRONG . . .

. . . SEE FOR
YOURSELF!

The popular NATIONAL AIROIL Steam Atomizing Oil Burner *thoroughly atomizes* and *completely burns* the lowest and cheapest grades of fuel oil or tar . . . requires only minimum supervision and maintenance. Only slight oil pressure and temperature is needed . . . and internal atomizing venturi feature assures a low steam consumption. NATIONAL AIROIL Type "SA" Oil Burner is adaptable to all types of industrial heating, power or process furnaces . . . is suitable for firing above stoker grates on conversion to oil. Other "SA" modifications designed for: the burning of Colloidal fuel ("SAR") — Large capacity operation ("SAL") — Sludge burning ("SAD") — Combined steam and mechanical atomization (Dual Stage).

WRITE FOR BULLETIN 21

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS Steam Atomizing
MOTOR-DRIVEN
ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, Combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
NAIROIL AUTOMATIC OIL BURNERS for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
AIR INTAKE DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL
BURNER CO., INC.

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Southwestern Division
2512 South Boulevard, Houston 6, Texas
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letters

. . . from readers

Claustrophobia?

Dear Sir:

The article "Does It Pay to Brick Up Windows?" by Roy A. Palmer, of the Duke Power Co., has come to my attention (Feb. I&P, p. 56). It is a perfectly logical article for some one in the business of selling artificial illumination to submit. However, to keep your readers enlightened (no pun intended) it is felt that they should hear something from the other side.

Does Mr. Palmer live in a windowless house? As solid walls are the things which he prescribes for factories and other types of buildings, shouldn't he be a strict conformist to his principles?

Yes, I live in a glass-walled house, and love it. I believe in my company's products and live with them. The solid portions of my home are brick because it is a good material and there are places for it. Tens of millions of people, however, do not believe in this feverish evangelism of bricking up windows because they like nature. Americans in ever growing numbers want to enjoy the outdoors even when they are inside. The most avid speleologist wants sunshine, daylight, and fresh air in the daily lives of his family and himself.

Apparently Mr. Palmer has not kept up with the modern glass materials which have been introduced during the past twenty years. Thermopane insulating glass has been advertised since 1941, and used in all kinds of buildings since the late 1930's. The dry air space between the two panes of glass is an effective insulator against heat, cold, and sound. Architects and engineers have specified Thermopane for some of the smartest buildings in the country because they can use every square inch of floor space. As only one example, 16,200 units were used in the John Hancock Building in Boston. This building is air conditioned. Employees work comfortably next to windowed walls, and appreciate the natural daylight on their work surfaces. Thermopane deadens 44 percent more outside noise than does single glass.

Thermopane goes hand in hand with air conditioning systems. By having window openings insulated, the size of the air conditioning equipment is often reduced by as much as one-third, which means an immediate saving in its cost and lower operating expense from the beginning.

Before and immediately after the start of World War II, there was considerable discussion of the merits of windowless factories. It was determined at that time that windows serve as safety valves with pressure from a bomb from the inside or outside. The pressure was dissipated through openings rather than having an entire structure become a heap of rubble. Whether a firm is operating on taxpayers' money or private capital, it is less expensive to replace only the windows than to reconstruct the entire building.

Superintendents of some of the South's largest textile mills have told us that their employees emphatically object to working in plants with solid walls. Many of these mills, because of the problem of humidity control, threaten to brick up the window openings, but have been prevented from doing so by the concerted opposition of their workers. Many of these same factories, in an effort to control humidity and satisfy their employees, have installed substantial quantities of Thermopane in window openings. Obviously, no company will do this unless there are definite advantages, one of which is the elimination of the dread of being in closed rooms and narrow spaces.

Many factories in the South use an obscure heat absorbing glass to control glare and screen out some of the sun's heat. Because they know the desires of the workers, however, they leave a vision strip of clear glass at eye level. Superintendents say, that if these vision strips are not provided to relieve the tension of being closed in, workers will deliberately break a pane of obscure glass to see outside. Maintenance ran to a considerable figure before vision strips were installed.

We have no quarrel with artificial lighting. A look at modern automobiles, the design of homes, schools, office buildings, factories, hospitals, and other types of buildings which are reviewed in the best magazines, prove conclusively that Americans want a greater feeling of space where they live, where they work, where their children go to school, and in the cars they drive.

Franklyn R. Hawkins
Advertising Manager
Libbey-Owens-Ford Glass Co.

Circle 521 on Reply Card for more data

HOW TO BUY ENDLESS BELTS

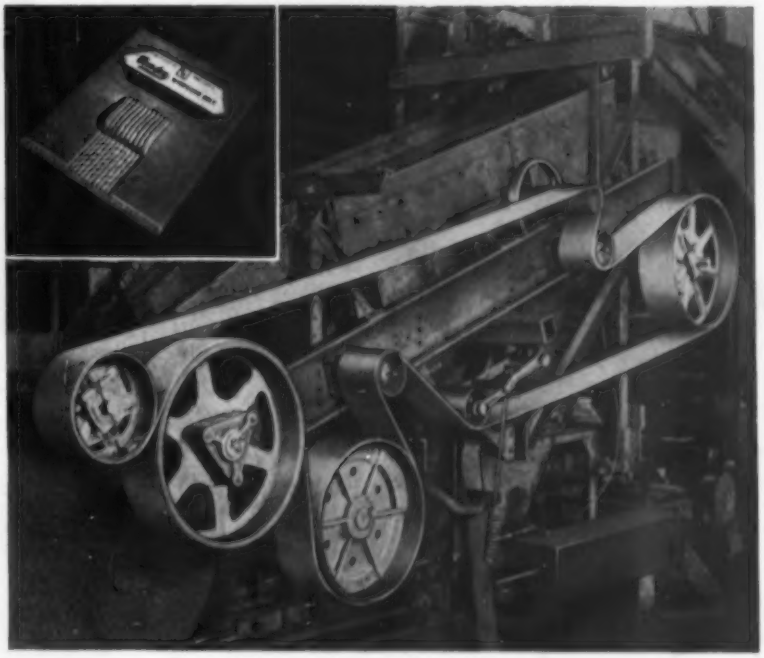
FOR LONGER LIFE on "Belt-Killer" Drives

"More Use per Dollar"

Look for a rubber belt engineered to give maximum flexibility and to eliminate belt shrinkage or stretch and separation at the cover-end.

Belt failures caused by excessive tensions, small pulleys and high speeds can be avoided by the careful selection of the endless belt you buy. Flexibility is of primary importance when selecting a belt for machines where serpentine drives supply power for several operations — for built-in drives with reverse bends and short centers. The belt you select should flex naturally in either direction . . . without stretching. It should be impervious to extreme atmospheric conditions because excessive shrinkage damages shaft bearings and shortens belt life. In ordinary belts, the cover-end tends to separate when rounding the pulleys because stress is concentrated in a narrow line seam. Look for the belt that extends the cover-end splice over a wide area so that stress is dissipated.

Specify, by name, the endless belt engineered to give you these advantages . . . specify Condor Whipcord Endless Belt.



CONDOR WHIPCORD ENDLESS BELT

An all-purpose belt designed for all types of endless drives, Condor Whipcord Belt offers exceptional advantages for "belt-killer" drives — short centers, small take-up, small pulleys, reverse bends, high speed and high tension. Extremely flexible, they feature an endless-wound, sealed-in cord construction which is pre-stretched during manufacture . . . they will not stretch or shrink on the drive and are virtually unaffected by variations in atmosphere. R/M's exclusive Extensible-Tip splice is a series of rubber rivets spaced over a wide area to secure the cover-end and eliminate cover separation. On some drives, Condor Whipcord Belts have outlasted 3 to 10 ordinary belts.

Let an R/M representative show you how you can get more dependable machine operation and longer endless belt life — "More Use per Dollar" — with Condor Whipcord Endless Belt.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

Circle 523 on Reply Card for more data

easy to install...

"Easy as putting in a pipe fitting"—that's what it's like to install a Yarway Impulse Steam Trap.

No special supports needed, because Yarways are light in weight, small in size—can be squeezed in most anywhere.

Plus these good features:

- **They get equipment hot in a hurry and keep it hot**
- **Good for all pressures**
- **Six standard sizes, ½" to 2"**
- **Long life...body and working parts are stainless steel**
- **Low maintenance . . . only one moving part**
- **Corrosion resistant, non-freezing**

Everywhere users are calling the Yarway Impulse "the little steam trap that does so much." Prove to yourself what it does by trying one for 60 days FREE in your own plant. Write . . .

YARNALL-WARING COMPANY
100 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY **Impulse® steam trap**

OVER 1,000,000 YARWAYS ALREADY SOLD THROUGH 250 CONVENIENT INDUSTRIAL DISTRIBUTORS

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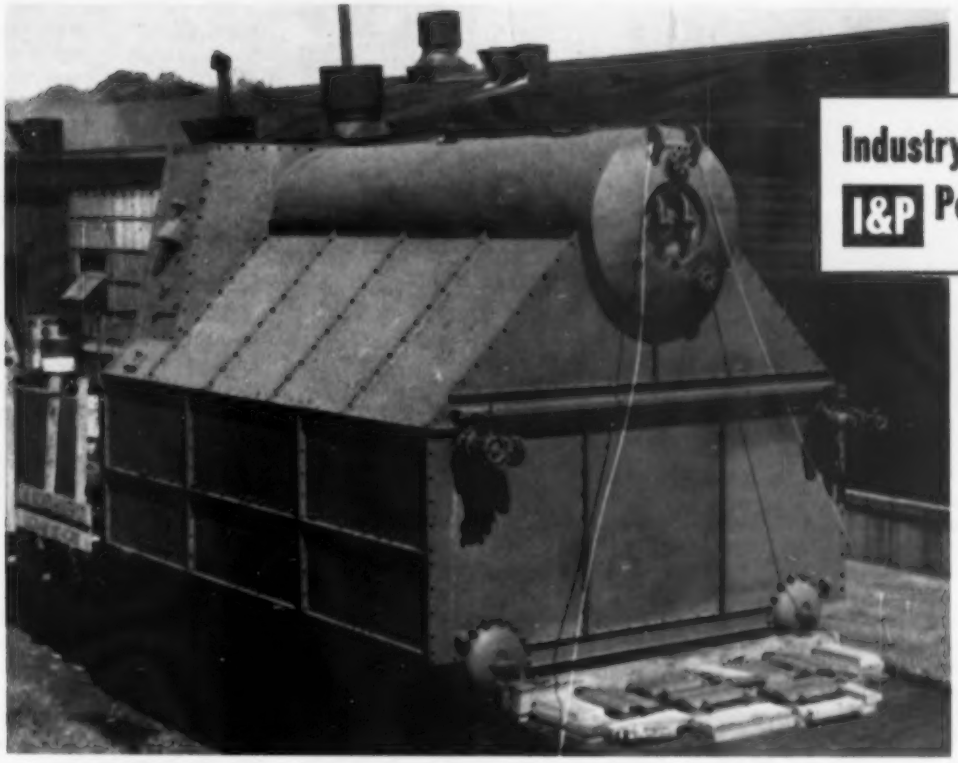

The packaged boiler arrives by railroad flatcar and is as completely assembled as possible.

Improving Your Steam Plant

I&P EXCLUSIVE

D. W. KARGER
Chief Plant and Industrial Engineer
The Magnavox Company

Mr. Karger graduated from Valparaiso University, receiving his degree in electrical engineering in 1935. He received his M.S. in General Engineering from The University of Pittsburgh in 1947. From 1935 to 1942 he worked for International Harvester, starting as an electrician and leaving as Acting Assistant Plant Engineer. For the next five years he was Headquarters Manufacturing Engineer and Supervisor of Co-operative Education for Westinghouse, and then spent a year with the Pennsylvania Electric Coil Corporation as Factory Manager. In 1948 he was appointed to the post of Manager of Organization and Systems with RCA, being responsible for all accounting and operating procedures and in 1949 set up an Industrial Engineering Department for the RCA Service Company. Since 1951 he has been Chief Plant and Industrial Engineer with the Magnavox Company in Fort Wayne. He is responsible for all mechanical, assembly, and test processing, standards, cost estimating, manufacturing procedures, plant layout, tool design, maintenance, construction, and power house operation. He is a registered Methods Time Measurement Engineer and Senior Member and Director of the Local Chapter of the AIIE.

DO YOU HAVE an obsolete steam generating installation, — one that is inefficient, operating only with a high maintenance cost, and having inadequate capacity? Are your boilers so undependable that it is a continual battle to nurse them through the heavy winter load?

You had company! Until the new installation in our Fort Wayne Plant was put on the line, all of those questions would have been answered with an emphatic "Yes" from us. It was an inherited problem that needed an immediate solution.

To complicate the problem, those of us in the Plant Engineering Department were comparatively inexperienced in this field.

We knew our old boilers were inadequate because we could not keep warm on cold days, and our steam pressure often dropped. How inadequate they were, we did not know. We had no steam flow meter and therefore no information on total

The foundation and brickwork were installed by an outside contractor, but this can be done by a competent maintenance crew. Good building pays off here.

steam load, to say nothing of information on process load versus heating load. We could not have been in worse shape!

Determination of Requirements

Before we could proceed intelligently with the correction of our problem, it was obvious that we had to know how much steam was really needed at the maximum and minimum load points, both for the present plant and for the planned future.

In order to accomplish this task of steam load determination in a satisfactory manner, we called in the experts — a consulting engineering firm. This was done for several important reasons:

¶ It was believed that the cost of the investigation, provided that the objectives were properly set and that limitations were placed at the correct points, would be lower than if we attempted to do it ourselves because of the consultants' greater experience in the investigation field.

¶ It was expected that because of their experience in many plants, they probably could suggest improvements that would more than pay for their services. We probably never would have thought of these improvements, had we carried out our own survey.

¶ Although we knew many of the things that should be done, we felt that with the backing of a good consulting engineering report there would be a better chance of selling our ideas to top management, when we came to ask for funds to make the improvements.

Scope of Survey

It was decided that the consultants should determine maximum and minimum steam loads for both process and heating requirements and generally analyze and indicate the good and bad points of both our steam generation and steam utilization equipment. They should also make general recommendations (not completely engineered solutions) concerning possible improvements of the main bad points noticed in the survey, and make a general recommendation concerning the improvement and correction of our steam generation equipment.

Economic Considerations

The improvements suggested by the engineering firm indicated a yearly savings of $32,000, so the $2500.00 spent on the original survey plus the $800.00 charged for subsequent advice was, in our estimation, money well spent.

It is believed that the chart illustrates the data obtained on our steam load. Basically, this information was arrived at by computing heat loss in

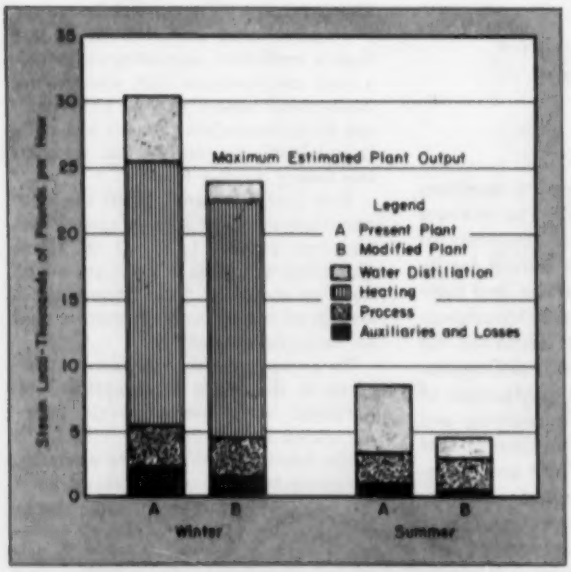

Chart of existing and future steam load requirements.

Two cranes easily moved the boiler to its location.

The boiler is lowered onto the cradled supports. The furnace will now be enclosed in sheet steel, lined with refractory, and the stoker installed.

the building, measuring certain items of process load, and estimating other process loads or losses.

Even after evaluation of the possible improvements to our steam utilization equipment, it was obvious that additional capacity was required for the steam generation plant. The next step, therefore, was to determine the size of the new boiler.

We had to decide if the entire system should be replaced, or if we should merely install a major unit and use the old installation as a reserve. Considering the size of the summer and winter load, it had to be determined whether one big boiler could be installed to handle the major load and yet yield good efficiency on light loads. The other alternative would be to install a major unit and to plan on using the existing unit to help on heavy loads.

Old Boilers Costly

We knew that our old fire tube boilers had high maintenance costs because they generally had to be operated at maximum capacity. There was little to be gained by removing the old boilers and setting new ones in their place because of the construction of the boiler house, and it was doubtful if management would approve an expenditure to cover complete replacement of our present system. The coal handling installation could be modified for use with a new boiler at little extra expense, and it was felt that the present boilers would operate at a reasonable efficiency with reasonable maintenance costs under light loads. Their efficiency, however, would not be equal to that of a new boiler.

The three fire tube boilers each had a capacity of 7000 pounds of steam per hour. In addition, there were three small boilers of the oil or gas fired type installed in other portions of our plant that were utilized only during the heating season, one only under maximum load conditions. It was intended to eliminate these remote boilers if a new boiler was installed. We came to the conclusion that a major unit should be installed and the old installation used as a reserve, assisting the new boiler during maximum loads.

The size of boiler eventually selected was a 250 hp water tube boiler of the "A" type, having a maximum rated capacity of 22,000 pounds of steam per hour. We were careful to select a new boiler that could be used to handle the light summer loads, if the existing boiler plant installation were entirely replaced at some future date by another coal fired water tube boiler.

Summer Loads

The eventual handling of light summer loads had to be very carefully considered since there is a practical limit to efficiency, and even more of a limit to the minimum capacity that can be reached with the type of firing we expected to use. The contemplated firing was to be by means of a spreader stoker, which would not allow us to reach as low a limit as oil firing, gas firing, or underfeed stoker firing.

The maintenance foreman in charge of the boiler plant was included in all of these discussions. In our plant, the maintenance foreman in charge of pipefitters and sheet metal workers is responsible for the powerhouse operation. His experi-

This front view of the boiler shows the arrangement of the water level gage.

ence and services were invaluable, and without him the task could not have been completed on time or within the appropriated budgets.

Having decided on the boiler size, the next decision to be made is which type of boiler to install. There are two major types available, fire tube boilers and water tube boilers.

Our experience indicates that fire-tube boiler maintenance costs are high if they are operated near peak capacity, and they are even higher if large varying loads are imposed upon such an installation. We believe that still another limitation exists in the type of firing used, when the boiler is coal fired.

Water tube boilers can be purchased in virtually any size desired, and we think they generally yield higher operating efficiencies than fire tube boilers.

If engineering costs are to be kept to a minimum, a packaged type indoor or outdoor water tube boiler, can usually be purchased in a size to meet all ordinary small to medium loads. Packaged water tube boilers for inside installation have, of course, been available for many years, and provide a standard approach to this problem. Outdoor boilers of the packaged type are relatively new.

Packaged Generators

A still more recent approach to small and medium size steam requirements is that of the completely packaged steam generator where everything comes with the unit — firing equipment (usually oil or gas burners), controls, pumps, and valves. These are not, in our opinion, however, as flexible or efficient.

We went to a packaged type water tube boiler in order to keep our costs down, both for engineering and installation. Since we wanted to eliminate the erection of a large building to enclose the boiler and because no room was available within the existing boiler house, we finally selected an outdoor boiler. This type of installation permitted us to consider every aspect of our problem, just as with a specially designed and constructed boiler.

The packaged boiler had the effect of reducing our costs, not only for engineering, but also for erection and for housing the equipment. It also simplified the selection of auxiliary equipment for the boiler.

We were, however, forced into enclosing the front of the boiler because we intended to fire with coal.

In selecting the specific boiler from the manufacturers, take into consideration the caliber of the manufacturer's representation in your area. His representatives can be of inestimable value in helping you proceed with the installation. Do not depend entirely upon him, however, when it comes to recommendations concerning size, make, and type of auxiliary equipment. It has been our experience that one can be easily misled if recommendations are not carefully checked.

The term "Packaged Boilers" is somewhat misleading. One must become involved in all of the engineering details related to the auxiliary equipment, housing, and installation. While these problems have been simplified, they are still of major importance and one must find the right solutions. To illustrate this, consider the fact that our contract with the boiler manufacturer amounted to $25,500.00 whereas an additional expenditure of $34,260.00 was required to put the boiler into operation.

Installation and Erection

The foundation and brickwork are to some extent dependent upon the type of firing to be used in the boiler. The boiler manufacturer and the manufacturer of the firing equipment will work together in order to produce proper foundation and brickwork drawings. While it is a cooperative effort, the drawings actually will come from the boiler supplier.

The foundation itself is not too complicated, and it can be installed by your own maintenance personnel if a reasonably competent force is available. The other approach, which we used because of other commitments, is to obtain several quotations from local contractors and let this work out to one of them.

The erection of the boiler on the foundation is a sizable project and requires specialized equipment. We contracted with a local machinery and equipment mover to unload the boiler from its flatcar and erect it on the foundation. Two large cranes were eventually used in the erection as shown in the photograph.

Should you use a contractor for this work, it is recommended that you use the most reliable and experienced one available in your area. This is an item not guaranteed by the boiler manufacturer, and in order to ensure low maintenance and replacement costs, the best possible ingredients and skill should be utilized for this phase of the installation.

Piping

In the installation of piping, assistance can be obtained from the local representatives of the boiler supplier. We received material assistance from them although we did not receive a complete piping diagram.

The size and kind of pipe and fittings depend upon the pressure at which you intend to operate the boiler, how it must be tied into the existing system, and the maximum output of the boiler. Handbook data, available from a variety of sources, can help you with this phase of the problem. The manufacturer of the major components required on the installation should be consulted before actually placing orders for the piping and fittings.

Our particular problem was complicated by the fact that even though we intended to operate the boiler at the very moderate pressure of 80 psig, we had to reduce the pressure to that of our existing heating installation. This operated at 12-13 psig, and we had to install a pressure reducing valve of large capacity.

Planning

The piping planning should take into consideration such items as:

¶ Steam flow meters requiring an orifice plate to be inserted in a straight length of pipe of the proper length.

¶ Measurement outlets for any pressure regulating equipment.

¶ Instrumentation requirements such as firing control equipment and pressure indicators.

Unless your maintenance department has had experience in handling high pressure steam piping, it is well to consider contracting for the installation. High pressure piping requires welding to meet ASME and State Code requirements. We saved on this item by buying the necessary pipe and fittings and doing our own installation work.

Accurate Diagrams

A word of caution concerning the necessity for completeness and accuracy of the piping diagram is not amiss. Generally the pipe is purchased cut to length. This can, however, be accomplished in your own plant. Even more important is the ordering of the necessary flanges and valves. If you have not ordered the proper material in the correct quantities, you may find yourself delayed for a considerable length of time for such a little item as one pipe flange. Another item that is often forgotten is high pressure gasket and packing material for the flanges and valves.

Now the job is finished. It was a demanding project, but the results are satisfying. Now we have an efficient dependable steam supply, one that handles our heavy winter load and can carry us through the summer with a good efficiency.

Addition of new equipment to supplant the old is most effective when a comprehensive, long-range system growth plan is used.

Modernizing Industrial Power Systems

WARREN R. CRITES
Industrial Engineering Section
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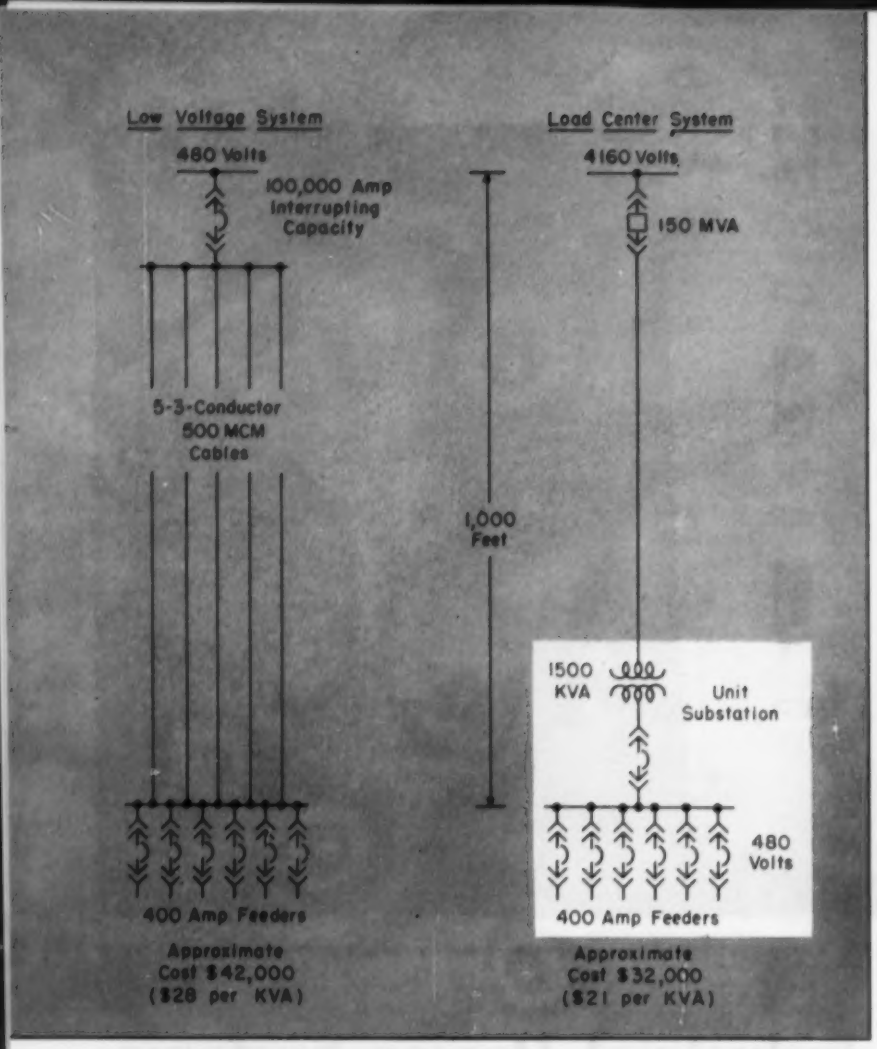
I&P EXCLUSIVE

MODERNIZATION OF an industrial power system can take two forms. The first is straight modernization, which occurs because some part of the system has become unsafe or obsolete. This kind of modernization is accompanied by little or no expansion of system capacity. The second type of modernization stems from an increased amount of load in existing areas or by an increase in system capacity to serve new areas. In either type of modernization, the best approach to system layout is to make a preliminary plan for an ideal power system to serve the load. Following this, the preliminary plan should be modified wherever possible to use existing equipment in good condition.

Too often, the existing system is given the first consideration and this unduly restrains the freedom of planning necessary for a sensible modernization program. By setting up an ideal system first without the existing system in mind, the principles of the ideal will prevail when the second step is performed (fitting the existing equipment to the ideal).

The introduction of two changes during modernization generally can be depended upon to yield the greatest return per dollar invested: using a higher primary distribution voltage, and introducing the load center concept of distribution. These factors are particularly advantageous in systems of several thousand kva that presently distribute power around the plant at 600 volts or less, and in large power systems of several tens of thousand kva that presently distribute power at 2400 volts. (It is not necessary to make any change in the utilization voltage (the voltage at the load devices) to gain the benefits from use of a higher primary voltage and the load center system.)

Essentially what happens is that a high-voltage grid is superimposed over the existing system so that power is transmitted from the service entrance, or plant generators, to load centers at the higher primary voltage. For example, 4160-volt "backbones" have been superimposed on 480-volt and 600-volt systems. Power is then carried at 4160 volts to the load center substations where it is stepped down to 480 volts or 600 volts and fed into the existing distribution systems. In either case, the original low-voltage system is not materially altered at utilization levels. In large multi-building plants, primary networks up to 69 kv have been installed on top of 6.9-kv sys-



Distributing power over long distances at low voltage costs 33 percent more in this example, than distributing with high-voltage load center.

tems. Within specific areas, the 69 kv is stepped down to 15 kv or less for the immediate loads.

There are several advantages to distribution at higher voltages under the load center system:

¶ Plant expansions can be effected at lower cost.

¶ The short-circuit current available at any point in the system is reduced.

¶ Voltage drop along the plant feeders is reduced.

¶ Modernization programs may be carried out on a step-by-step basis.

The best time to consider changing to load center distribution at higher voltage levels is when substantial load is to be added to the system or when installing new system equipment such as switchgear, transformers, cable, generators, and the like. Piece-meal addition of feeders, transformers, and switchgear does not represent as wise a move as does consideration of the entire system when any substantial system purchases are to be made.

There are many factors that may indicate a need for system modernization: switchgear may be obsolete and hazardous to personnel and property; interrupting capacity of breakers may be inadequate due to random load growth that was not accompanied by short-circuit analysis as the growth progressed; old transformers may be found to have weak insulation and high losses; cables may be old, and their insulation brittle and susceptible to failure.

In one installation plant engineers realized that the oil circuit breakers on the 600-volt system were inadequate. They had considered installing new 600-volt switchgear. They found, however, that by rewinding one generator for 2400 volts and by installing a load center system, they could get a completely new distribution system (including substations and rewinding of the generator) for only 23.5 percent more than the cost of putting in a new 600-volt switchboard. They bought the advantages of modern distribution for little more than the cost of up-dating an antiquated system.

Two-Pronged Attack

In another case, a metal working plant found that it had substations of very large capacity (5000 kva to 10,000 kva at 480 volts) without having adequate switchgear. The system was experiencing voltage drops of 20 percent, resulting in operating difficulties with much of the plant's equipment. One remedy might have been the replacement of the old substations with large unit substations of modern design. However, such large substations are expensive and do not lend themselves to future change.

Further study of the system showed that a two-pronged attack on the problem was in order. First, many large motors were operated in the plant. These would be better served at 2400 volts than by the present 480-volt service. It was planned, then, to set up some substations with 2400-volt secondaries to feed the large motors. The old, large 480-volt motors were replaced by 2300-volt motors as time went by.

The second prong of the attack was the placement of small substations around the plant to replace the existing large substations. Voltage regulation on the feeders would be improved and great amounts of secondary feeder cable could be sold as scrap. As it worked out, the load center system finally adopted cost about 10 percent less than the cost of replacing the existing substations in kind. Voltage drop was reduced to 2 percent (from the original 20 percent). The entire modernization program was completed by installing a few pieces of equipment at a time so that no large expenditures were required in any one year.

Cable Failure

The factor initiating modernization often is cable failure. Cable insulation becomes brittle and weak after a period of time. When re-wiring is planned, it is often judicious to consider a complete revamping of the power system.

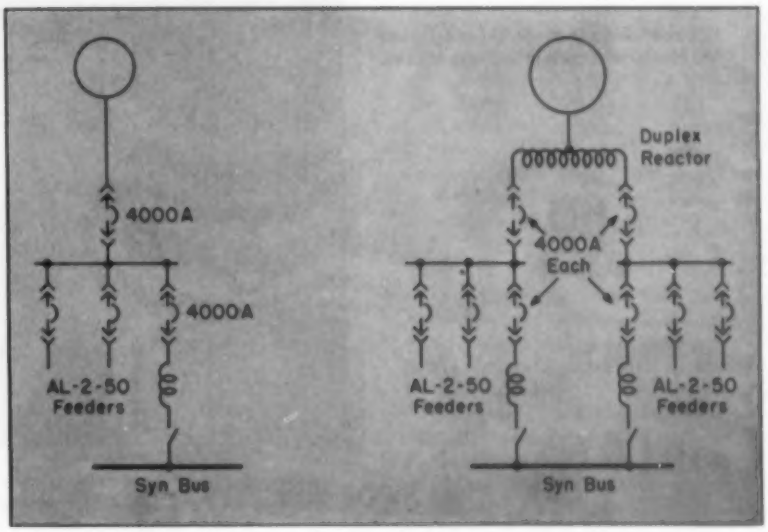
One plant had about 10,000 kva at 600 volts fed from one substation. It was estimated that replacing the 25,000 ft of cable would cost $5.60 per ft or $140,000—not including the cost of pulling out the old cable from its underground ducts. A modern load center system was installed for $190,000. On a 10-year basis, the $1500 annual savings in power due to eliminated copper losses helped reduce the system cost to $175,000. Some old

transformers were sold for $17,500 so that the extra cost of the load center system was only $17,500 more than mere replacement of the cable. Other advantages included reduction of voltage drop from 10 percent to 1.8 percent, provision of adequate interrupting capacity in secondary switchgear, flexibility, and the prospect of low-cost expansion.

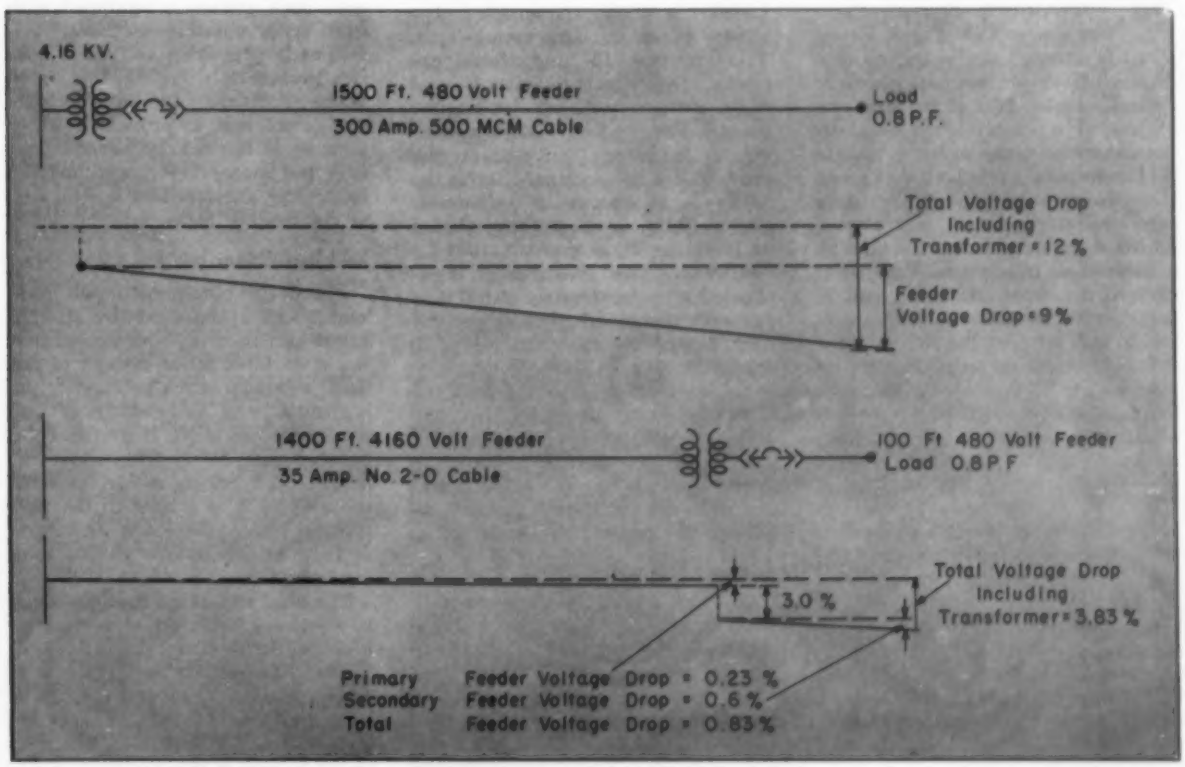
Interrupting Capacities

In plants generating their own power, addition of more generating capacity often calls attention to the inadequacy of old circuit breakers as far as interrupting capacity is concerned. In one plant, the addition of a modern turbine-generator brought the available short-circuit current to about 165,000 amperes. This incidentally caused renewed attention to the fact that 115,000 amperes of short-circuit current had previously been available. This had been three to five times the interrupting capacity of the existing oil breakers.

The addition of a new generator at 480 volts plus modernization of the existing system would have cost $205,000. The complete cost for the additions and modernization at 4160 volts would be $186,000. The addition of new capacity at 4160 volts also had the advantage that future addition of a generator at 4160 volts necting breaker. But adding a turbine generator to the 480-volt bus would cost but $12,500 for the would demand $49,000 for the necessary switchgear. So it is again apparent that long-range thinking often proves to be advantageous over short-term, stop-gap additions to industrial power systems.



When system load grows and voltage cannot be raised, available short-circuit current can be held down by feeding through reactors.


4.16 KV.
1500 Ft. 480 Volt Feeder
300 Amp. 500 MCM Cable
Load 0.8 P.F.
Total Voltage Drop Including Transformer = 12 %
Feeder Voltage Drop = 9 %
1400 Ft. 4160 Volt Feeder
35 Amp. No. 2-0 Cable
100 Ft 480 Volt Feeder Load 0.8 P F
Total Voltage Drop Including Transformer = 3.83 %
3.0 %
Primary Feeder Voltage Drop = 0.23 %
Secondary Feeder Voltage Drop = 0.6 %
Total Feeder Voltage Drop = 0.83 %

Voltage profiles show how distribution at higher voltage reduces voltage drop between source and load. Advantage is gained chiefly in feeder drop, which falls from 9 percent on low-voltage feed to 0.83 percent on the high-voltage feed.

The coal storage dock, showing loading stations in reclaiming tunnel roof.

I&P EXCLUSIVE

Coal Handling at Oak Creek

C. A. HOYA, Engineer
Chain Belt Company

THE WISCONSIN Electric Company's new Oak Creek Power Plant is situated at the bottom of a high bluff along the west shore of Lake Michigan. Part of the bluff was excavated to accommodate the plant, the excavated material being used as fill for the man-made land that forms the coal-storage dock. The 18½ acre coal-storage dock is protected on the three sides facing the lake by a sheet-steel-piling wall. Parallel to each of the three lake sides, and 30 feet inward, is another sheet-steel-piling wall forming the limits of the actual coal-storage area. The top of this wall is 13 feet above the dock floor. A "fair-weather" slip is located along the south face of the coal-storage dock.

Source of Supply

The midwestern slack coal used in this plant is supplied by self-unloading boats from South Chicago. Radar buoys guide an approaching boat to the dredged turning basin ahead of the slip. With the aid of a "pivot pile" and suitable cable arrangement, the boat is turned so that it enters, stern first, for mooring in the slip. Rapid departure is then possible, should an unexpected storm arise.

The boat's boom conveyor discharges coal onto an initial pile from which tractor-drawn scrapers distribute it over the large storage area. Two scrapers, 10- and 18-ton capacity, are available to move the coal to the extreme north pile for inactive storage. For temporary storage, dozing is employed. The coal on the south half of the dock constitutes the "active" or normally-reclaimable supply. Total storage capacity (based on 100-ft depth) is approximately 2,000,000 tons. Coal consumption is estimated at approximately 30,000 tons per unit per month, but at present only two of the four planned units are in operation. Coal is reclaimed—presently at the rate of 600 tons per hour—by means of gravity feed onto a belt conveyor running in a tunnel with a flat roof projecting slightly above the dock floor. This tunnel and conveyor are 100 ft inward and parallel to the south face of the dock.

Loading Stations

The roof of the tunnel is provided with a row of 12 loading stations centered over the axis of the belt; stations are spaced 50 ft apart. Most of the "active" coal gravitates to this reclaiming conveyor, and the remainder is moved by bulldozer.

Each loading station has a hopper with a bar grate on top and a duplex undercut gate at the bottom. A hinged and counterweighted chute leads from the hopper to the belt. These chutes have stainless steel liners. When a chute is not in use, water seepage flowing from the hopper can be drained to one side of the conveyor by means of a detachable trough mounted at the lower edge of the hinged chute.

To cope with the handling of hot coal, each station is equipped with fixed spray nozzles—one nozzle immediately preceding and three nozzles immediately beyond the chute. When required, the first nozzle sprays the belt to provide a water film, while the nozzles beyond provide the quenching sprays. During reclaiming an attendant is stationed at the loading chute.

Snubbed Offset

In order to obtain maximum horizontal length and then rise sharply (18 degrees), the 48-in. tunnel belt has a snubbed offset instead of the usual catenary at the junction of the horizontal and inclined runs. The horizontal run is 562 ft long and the inclined run, 261 ft. This conveyor, driven by a 100 hp motor, elevates the coal 75 ft to a level in the first transfer tower where it is discharged at right angles onto a second conveyor belt.

The head end of the first conveyor is equipped with an electro-magnetic pulley of 60 in. diameter—the world's largest for coal handling. Tramp iron is discharged through a chute to a small bin at the base of the tower. Magnetic vibrators, attached to the bottom of the discharge chute at the head end of the conveyor, facilitate the flow of sluggish fines. A

View in reclaiming tunnel, showing belt receiving its load. The three water-spray pipes are clearly shown. Walkway side of conveyor is well guarded.

coal sampler receives its charges from the discharge stream at this point in the system.

The second conveyor leading to the next transfer tower is a 36 in. belt on 137-ft centers. It is driven by a 50 hp motor, and incorporates a Weightometer. Discharge is about 130 ft above the storage dock.

Three Routes

The discharge from the second conveyor can be diverted three ways: to a conveyor that serves the two silos located in adjacent corners of the boiler rooms of the first two units; to an identical conveyor now under construction that will serve duplicate silos for the third and fourth units; or to a bin (partly in the tower) that can serve trucks for transporting coal to another of the Company's electric generating plants at Lakeside, nine miles farther north.

Every conveyor in the system has a head end drive consisting of a direct-coupled speed reducer with holdback and direct-coupled motor, a gravity take-up at the foot of the incline, a rotary nylon-bristle brush at the head pulley, and a deflecting plow over the return belt at the foot pulley. The first conveyor also has another brush and plow at the snub-bed offset junction.

Control Panel

The master control panel for all conveyors is located in the first transfer tower. In addition, an emergency trip cord, connected to an electrical cutout, extends full length alongside each conveyor. The presence of a stream of coal passing over a discharge pulley is indicated at the panel by means of an electrical-contact finger located above the pulley. A plug-in phone makes it possible for the operator in the reclaiming tunnel to readily communicate with the operator at the control panel in the tower above.

All conveyor galleries are inclined at 18 degrees. For the greater part of their length they are open to the weather, but the conveyors are protected by semi-circular, sectional, hinged covers, even for those sections within the towers and boiler room. Every coal transfer point beyond the 12 tunnel-belt chutes is connected to a dust-removal system.

Emergency coal handling for the first two units involves the use of a 30-in. car unloader, a 30-in. belt conveyor, and a bucket elevator. The unloader and conveyor are portable, but the elevator is permanent. Coal can be moved from hopper cars and discharged into the two silos at the rate of 100 tons per hour.

The silos—one per boiler—are 33 ft inside diam, made of reinforced concrete, and have twin-hoppered steel bottoms. Approximate coal capacity is 1,200 tons per silo.

Pulverizers

Two pulverizers or mills are located beneath each silo at the hopper outlets. Each mill is direct coupled to a 350 hp motor, and has a capacity of approximately 25 tons per hour. Twin, rotary feeders regulate the rate of coal flow to each mill. These feeders have ratchet-and-pawl drives with magnetically-controlled pawls that provide temporary shut-off of feed when surges occur. The mills grind the slack coal so that 65 percent of it would pass through a 200-mesh screen.

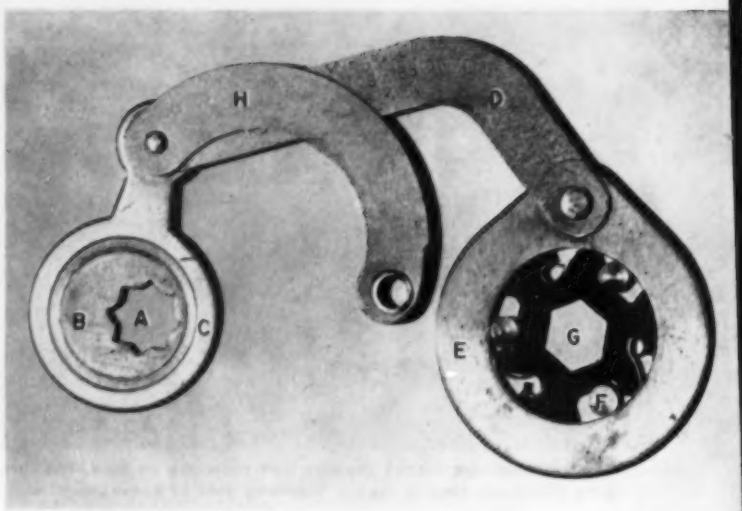
A closed windswept system carries the coal from each mill to a cyclone from which the air is returned to the mill. Coal from the cyclone goes to a pulverized-coal transport pump which, by means of compressed air, forces the coal through a six-in. coal transport line to a 500-ton capacity overhead bin.

The loading stations in the reclaiming tunnel, the machinery and steel frames for the permanent conveyors, and the emergency elevator, were furnished by the Chain Belt Company. Design and construction of this plant were under the supervision of the Wisconsin Electric Power Company's engineers.

When completed the plant will be the largest in Wisconsin.

Three conveyors elevate coal about 130 ft to the pulverizers. The chimney shown at right is for the proposed third and fourth generating units.

The Revco unit uses cams and over-riding clutches. The spring loaded clutch mechanism is shown here.



Variable Throw Transmissions

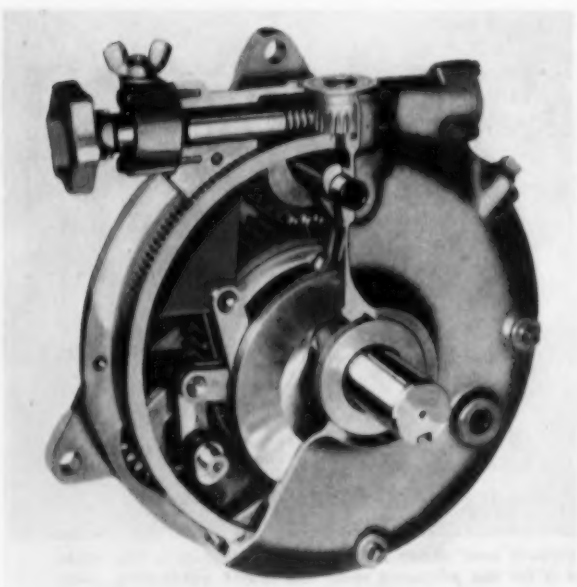
I&P EXCLUSIVE

RICHARD LeBARON BOWEN, JR.
President and Treasurer
Coated Textile Mills, Pawtucket, R. I.

THERE IS a small group of mechanical wide range variable speed transmissions on the market today that has found its own place in industry. This is the intermittent grip or variable throw transmission. There are several mechanisms available, all operating on the same general principle. An eccentric cam is fixed to the input shaft, and an over-riding or one-way clutch is fixed to the output shaft. A mechanical linkage connects the cam to one element of the over-riding clutch which acts as a ratchet. Means is provided for varying the movement of the mechanical linkage so that speeds of maximum to zero are possible.

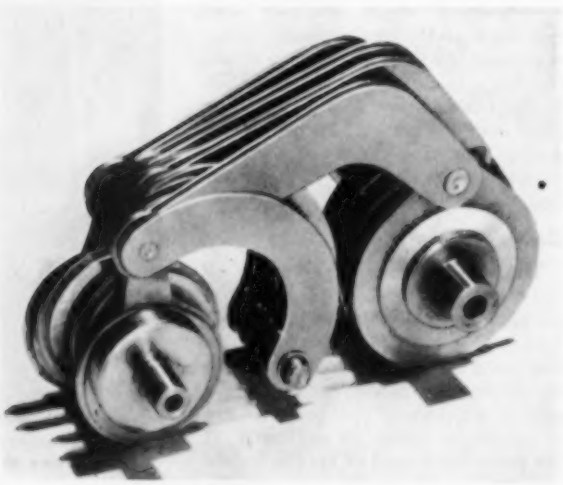
Revco, Inc. uses conventional cams and over-riding clutches on its line of fractional hp units. As shown in Fig. 1, eccentric cam B fixed to the input shaft A imparts motion through connecting link C to main link D, which is thrown toward over-riding clutch E. As the clutch housing is rotated clockwise, its spring urged rollers are wedged to the roller carrier forcing the output shaft to turn. On the return half of the cam cycle, the motion of the clutch is reversed, and it rides backward over the forward turning shaft. A secondary link H is connected to the junction of links C and D. The output speed is varied by movement of this secondary link. At zero speed the connecting link C moves up and down and imparts no motion to link D; at maximum speed link C produces maximum movement in link D. Infinitely variable speed is the result.

Revco's units, like all variable throw transmissions, can be adjusted while at rest, so that speeds can be



Left—The Morse Chain unit is arranged around a central eccentric cam and uses three over-riding clutches.

Below—Four assemblies smooth out pulsations in the Revco transmission which will operate in any position.



preset. When in motion they can be adjusted instantaneously. Since it is evident that the output speed with a single clutch would be intermittent, it is common practice to have four of the assemblies arranged so that as one clutch releases, one is in contact. With only one assembly the output speed would be of a pulsating nature, but with several of the assemblies, the speed pulsation is not objectionable. Units are available in sizes from 1/10 to ¾ hp, and some sizes can be obtained in reversible models. Maximum output speed is one quarter the input speed, or 450 rpm with an 1800 rpm motor. Input speed can vary from 2800 to 2 rpm, and infinitely variable output rotation can be obtained by mere oscillation of the input shaft.

Morse Chain Company manufactures one of these ratchet transmissions for use in conveyor drives. The unit consists of three over-riding clutches arranged around a central eccentric cam. Adjustment of a worm simultaneously changes the throw of the three idler links connecting the cam and the clutches. Maximum output speed is 22 percent of input speed. The maximum allowable input speed is 250 rpm, and the unit is rated at 2 hp. Maximum speed variation is about 27:1.

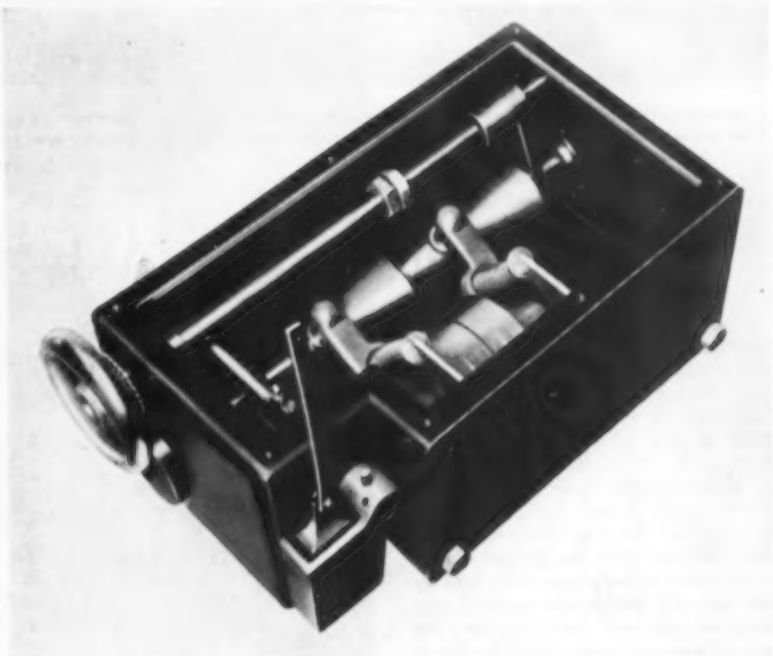
Omega Unit

Another variable throw transmission is manufactured by Omega Machine Company as a variable speed element for many of their automatic chemical feeders, and has been used on over a dozen models of dry feeders. This transmission differs from the two described above in that variable throw is produced by two eccentric cones each having a concentric end (Fig. 2). Output speed is varied by moving the cams perpendicularly under the rocker arms which are connected to the overrunning clutches. At the small concentric ends there is no motion imparted to the rocker arms, while maximum motion is obtained at the large ends. The cams are generated so that they drive forward for 2/3 of a revolution and return for 1/3. Speeds of zero are possible, but the units ordinarily have a reproducible range of 100/1. On special occasions they have been furnished with 400/1 ranges. This type of proportioning application does not require zero speeds but does demand exact reproducibility over a wide range. Output speeds can be reproduced very accurately as long as the unit is not overloaded. Maximum recommended input speed is 360 rpm and the maximum output speed is 30 rpm, a reduction of 12/1. The unit is rated at ¼ hp at maximum speed.

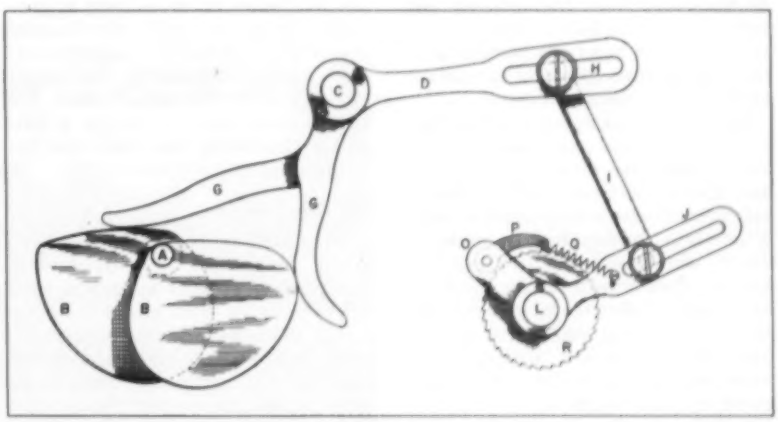
All three of the variable throw transmissions just listed use the principle of the over-riding clutch. A series of rollers are located between the outer clutch housing and the roller carrier fixed to the output shaft. When the clutch is loaded, the rollers are wedged between the carrier and the outer housing and on the return stroke they are freed.

The proper operation and the life expectancy of a variable throw device is dependent on the load applied to the clutch. If the clutch is overloaded, the life of the unit will decrease rapidly. In fact, a load reduction of 50 percent will increase the life ten times.

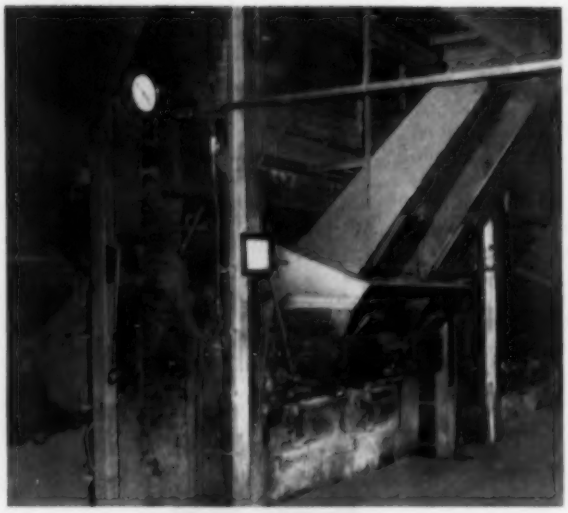
The principle of these transmissions has been known for over half a century, but only in the last ten years have industrial models become available. This is because of two factors: there is an increasing need in industry for wide range variable speed transmissions, and an engineered solution has been found to the problem of fatigue. In the future we can expect to see more of these variable throw units.



The Omega unit uses eccentric cones and over-running clutches. The wedge controller in the left foreground is for vibration of a feeding mechanism.



A patent was granted in 1890 for a variable throw mechanism used on plaiting machines. Output speed was regulated by moving link I along the slots.



Homer-Laughlin's boilers are fired by spreader stokers to permit efficient use of available strip mine coals.

Combustion controls and boiler instruments, mounted on panels, are near the boiler fronts on the firing aisle.

Solving a Fly Ash Problem

Better breeching design and a new fly ash collector have increased boiler capacity 30 percent, cut steam costs, and stopped a serious dust condition at Homer-Laughlin China Co., in Newell, W. Va.

I&P EXCLUSIVE

BY IMPROVING the design of the boiler breeching and by replacing an old baffle-type cinder trap with an efficient, low draft loss fly ash collector, Homer-Laughlin China Company, Newell, West Virginia, increased its total boiler capacity approximately 30 percent and significantly reduced its steam costs. At the same time, the new fly ash collector eliminated a serious dust condition that had been damaging as much as 15 percent of the chinaware produced by the plant.

Homer-Laughlin, the world's largest manufacturer of chinaware, uses large quantities of steam for drying "green" clayware and for heating an extensive manufacturing area. The main boiler house contains three, 350-hp Wickes three-drum boilers. To efficiently burn the high ash, high sulfur, strip mine coals available in this district at a low delivered price, the boilers have been equipped with Firite dumping-grate spreader stokers.

Before the new breeching and collector were installed, an old boiler house at the west end of the plant was needed to supplement the steam output of the main boiler house. It contained two small boilers, one equipped with a relatively old underfeed stoker and the other with a spreader stoker installed as a temporary measure to keep the steam capacity of the plant up.

It had been planned to eliminate the old boiler house as soon as possible, since the space it occupied was badly needed for manufacturing facilities. Increasing the capacity of the central boiler house had to be done without adding a new steam generating unit, however, because of space limitations.

Fly Ash Problem

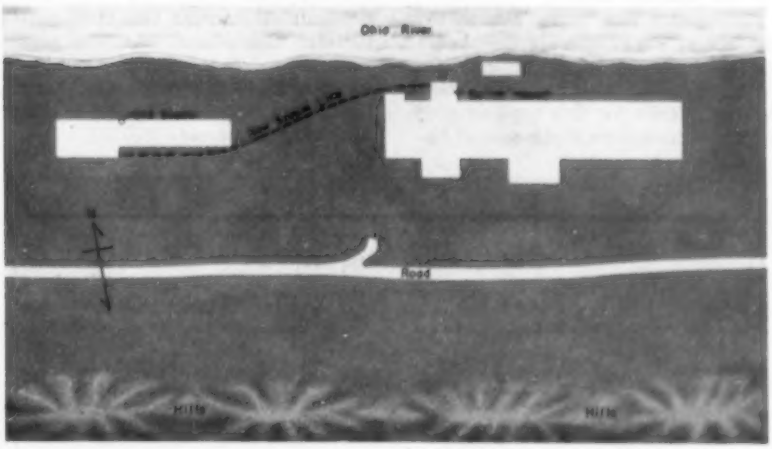
The plant is located on the Ohio River. Steep hills on both sides of the river frequently cut off normal air circulation, thus trapping the fly ash in the valley. Excessive amounts of fly ash were being produced because of the low grade coals being burned, and the existing cinder trap did not effectively collect it. Making the fly ash problem even worse was the location of the stack—approximately in the middle of the plant. The fly ash entering the plant caused serious difficulties in the manufacturing processes.

In making chinaware, clay is shaped and then dried in a tower heated with steam coils. After drying, the clay is fired in a kiln to produce a rough-surfaced bisque. While fly ash and other impurities do present some problems in the manufacture of the bisque, the contamination is not serious. The high temperatures and oxidizing atmosphere in the kiln tend to burn out these extraneous inclusions.

In the subsequent processes, however, contamination by fly ash and other forms of dirt spoils the quality of the chinaware being produced, and this requires downgrading or complete rejection. The glazing of chinaware is accomplished by spraying a water slurry of glaze onto the bisque. When fired at high temperatures in the kiln, this glaze softens and produces a very smooth glass coating on the surface of the ware.

If impurities are present in the glaze, they discolor the glass coat-

Fly ash difficulties were eliminated by installing a regenerative collector.



Plant site is beside the Ohio River where terrain restricts air circulation.

ing. For example, fly ash will stick to the wet surface of the sprayed ware. When fired, the combustible of the fly ash oxidizes, but the iron oxide contained in the ash dissolves in the glass and produces a brown stain. Other impurities produce other discolorations. Once a piece is marred, there is no way of correcting the imperfection and the product is unacceptable.

At the most serious stage, marred finish due to fly ash spoiled almost one-sixth of the total output of the plant, despite considerable effort to eliminate it. The most serious trouble was experienced during the early spring and late fall when the steam load for heating is high during the cold mornings. Later in the day when it warmed up the factory employees opened the windows, thus permitting the fly ash produced during the morning to blow in and drift about the factory. Since much of the ware necessarily stands loaded on racks for considerable periods of time between spraying and firing, a considerable amount was contaminated by the drifting fly ash.

Draft Deficiency

Because of a deficiency of natural draft, capacity of the main boiler plant was limited to a total of about 55,000 lb per hr. Part of this deficiency was caused by loss of draft through an improperly designed breeching. It had been installed in sections as the boilers were added, and contained several unnecessary turns and sharp corners. A "tee" connection caused additional draft loss because of impact between the gas streams from opposing boilers. Further draft loss occurred in a baffle-type cinder trap between the main breeching and the stack.

Demands for steam were as high as 60,000 lb per hr during the winter, thus making it necessary to operate both the main boiler house and the older, west boiler house. In an effort to increase the capacity of the boilers in the main plant, air leaks in the furnace were eliminated wherever possible. The boiler settings were tightened and sealed with sealing compound, and the stokers and their combustion controls were adjusted to burn as much fuel as possible with the limited gas flow. These measures, however, did not sufficiently increase the boiler capacity to permit abandoning the older boiler house.

Since a further increase in steam output required the availability of more draft, it was decided to redesign the breeching and, at the same time, install a more efficient fly ash

collector. The problem of fly ash collection at this plant was unusually difficult because of the wide variations in load—from 5000 lb per hr with only one drying tower in operation to an estimated 70,000 lb per hr in the winter with all equipment, including additional manufacturing facilities then in the planning stage, in service.

Selecting the Collector

Various types of fly ash collectors were considered and a Breslove Regenerative unit was chosen. The design of this type of collector permits a high collection efficiency to be maintained over a very wide range of gas flow—a desirable characteristic in view of the wide variations in boiler load occurring at this plant. In addition, the loss of draft in the Regenerative collector is very low, thus permitting a gain in draft when compared to the loss in the cinder trap it was to replace.

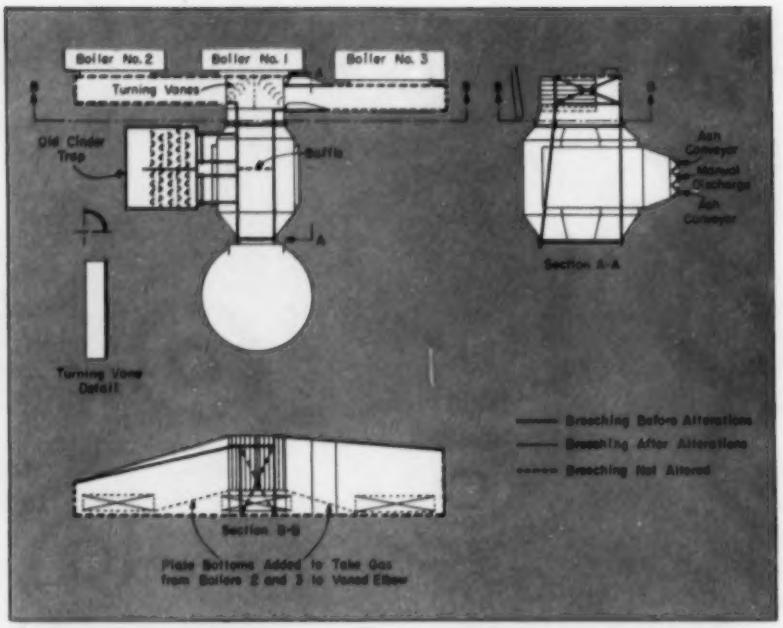
Besides furnishing the fly ash collector, the Breslove Separator Company designed the changes in the breeching. The changes were made by the plant's own personnel. The irregularities in the main outline were eliminated and the two turns that were necessary were rebuilt as vaned elbows. The left and right sides of the breeching and the center section were partitioned separately to avoid impact between the gas streams from opposing boilers. The connection from the main breeching to the stack and the old baffle type cinder trap were removed and replaced with the new fly ash collector.

Draft loss of the breeching has been reduced from a maximum of about .25 in. wg to about .05 in. wg. The new fly ash collector has a draft loss at maximum load of only .20 in. wg, while the old baffle-type trap caused a loss of over .25 in. wg. Thus, even with the considerably heavier gas flow now carried, the net draft available at the boilers is about .25 in. wg higher.

Increased Capacity

The additional capacity made possible by the increased draft has permitted carrying peak loads now running as high as 70,000 lb per hr without difficulty. Operation of the older boiler house has now been discontinued entirely and a new steam transmission line has been run from the central boiler house to the west end of the plant.

Eliminating the auxiliary boiler house not only has reduced the fuel, labor, and maintenance costs of operation, but also has eliminated a serious source of dirt from both the coal pile and from stack emission.



Drawing shows details of the changes that were made in the boiler breeching.

Dust Loading Tests

To establish whether the fly ash collector complied with the guarantees made by the manufacturer, stack gas dust loading tests were run by Homer-Laughlin's engineers with standard test equipment supplied by Industrial Hygiene Foundation, Inc. One test was run in summer with a boiler load of about 7000 lb per hr. The second test was run the following winter with a load of approximately 65,000 lb per hr. Both tests showed the dust emission well below the .85 lb per thousand lb loading guaranteed by the manufacturer.

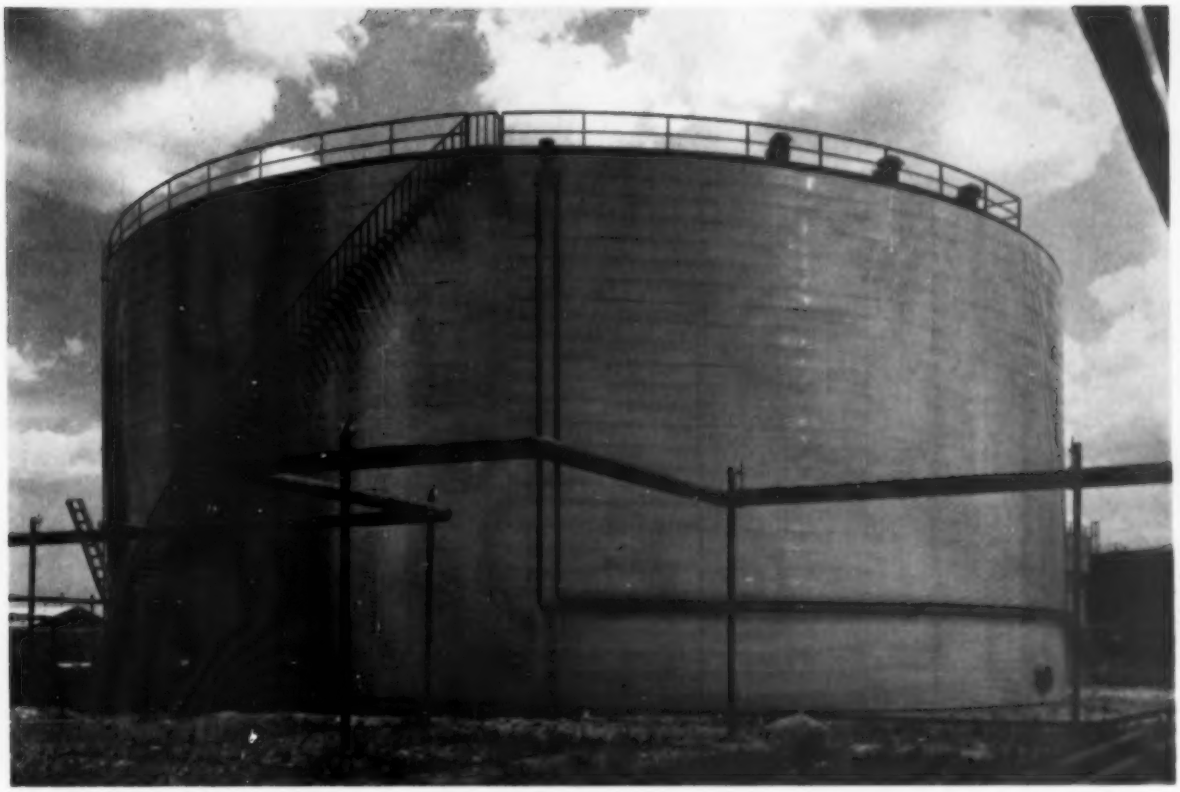
The losses due to fly ash in the surface of the chinaware disappeared very rapidly after the collector was installed. Normally it takes several weeks for this type of nuisance to completely disappear because of the dirt already deposited and stored in corners and gutters. In this instance, however, the management completely cleaned all of the building roofs and surrounding area while the collector was being installed. Several heavy rain storms, following very shortly afterwards, completed the process so that a minimum of difficulty was experienced from fly ash that had previously been deposited.

Results

In the first week the number of pieces of chinaware with finish marred by fly ash dropped very sharply from about 15 percent of the total production to about 3 percent. This spoilage continued to drop in the following weeks and then completely disappeared. At the same time, the increased capacity and better operation of the boiler house have made possible very appreciable operating economies.

PRINCIPAL BOILER HOUSE EQUIPMENT

Boilers — 3 drum, bent tube	The Wickes Boiler Co.
Spreader stokers — Firite 2C F.G. dumping grate	Hoffman Combustion Engineering Co.
Combustion controls	A. W. Cash Co.
Instruments	Bailey Meter Co.
Fly ash collector — Regenerative H-4-U	Breslove Separator Co.
Deaerating heater	Elliott Co.
Boiler feed pumps	De Laval Steam Turbine Co.



This attractive Gulf Oil Corp. tank at Chelsea, Mass., is saving money on heating, and the insulation is there to stay.

Permanent Tank Insulation Costs Less

I&P EXCLUSIVE

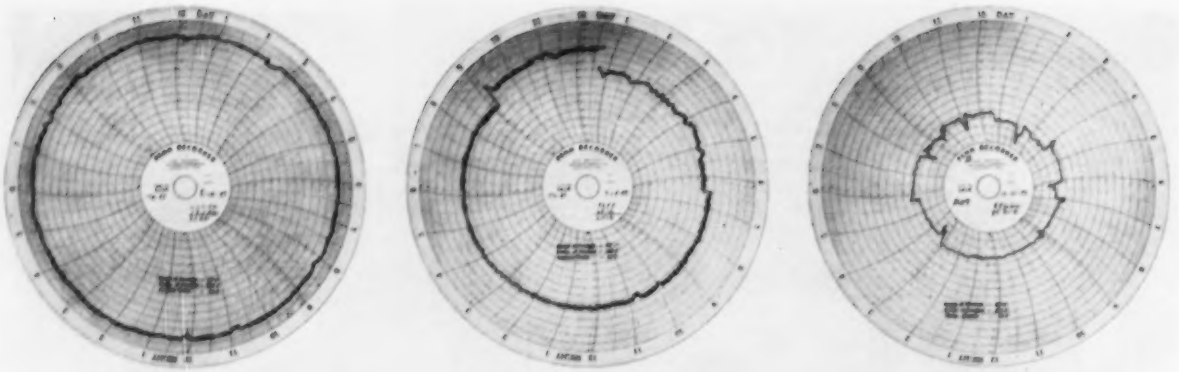
HEATNG COST COMPARISON BARE AND INSULATED TANKS			
Area	*Temperature*	*Tank diam. 120 ft*	*Tank height 48 ft*
Shell—18,100 sq ft	Product 140F		
Roof—11,310 sq ft	Mean Air 50F	*Storage of Number 6 Fuel Oil*	
Total—29,410 sq ft	Difference 90F		
		Bare Tank	*Insulated Tank*
Insulation characteristics		--	2" Fiberglas PF-612
"K" factor		2.5	0.23
Temperature difference		90F	90F
Btu heat loss/sq ft/hr		225	20.7
Btu tank loss hr. (29,410 sq ft)		6,605,000	610,000
Steam load (900 Btu)		.25 lb sq ft/hr	.023 lb/sq ft/hr
Steam load (29,410 sq ft)		7,350 lb hr	675 lb/hr
Heating cost ($1.00/1,000 lb steam)		$7.35/hr	$0.68/hr
Annual heating cost (8,760 hours)		$64,386	$5,957

INDUSTRIAL ENGINEERS have become very heat-conscious in the last decade, and long, exhaustive and intensive tests have been made to determine the savings that result from the insulation of bulk storage and handling equipment.

It has been found from experience that the fuel savings from permanently insulating asphalt storage tanks, for example, where the product must be stored at temperatures over 200 F, have completely paid for the installation in four months.

For Bunker C oil storage, where the temperature must be kept above 120 F, the return on the investment takes about two years.

Conventional tank insulation, until recent years, consisted of insulation blocks secured to the tank walls with metal bands. The banded in-



Before insulating | With side walls insulated | After insulation of walls and roof

Steam flow meter charts show drop in steam consumption for heating a big asphalt storage tank as insulation progresses.

sulation was then asphalt coated.

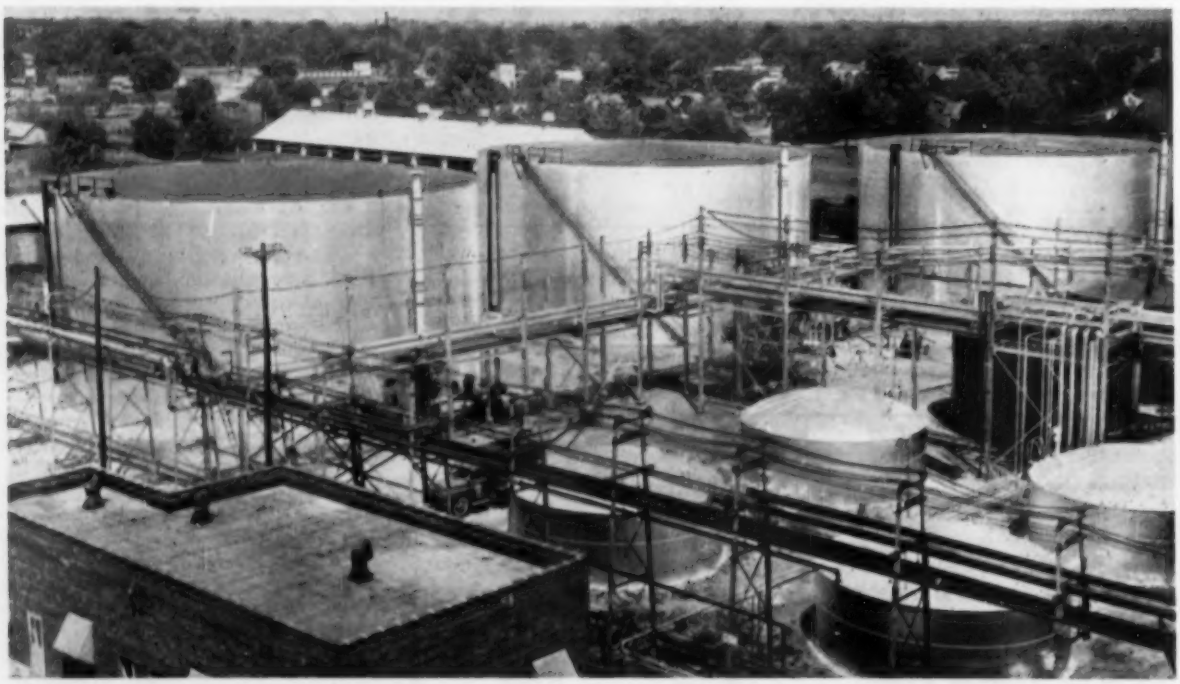
As it weathered, the asphalt wore away and unequal expansion caused the bands to burst. The insulation shrank, slumped, shredded, and fell loose. This allowed rain and snow to seep through shrinkage cracks in the outer coating, pitting the metal of the tank itself and reducing the insulation value. Such systems seldom anticipated the need for roof insulation, and the inadequuate flashings that were used actually accelerated structural failure of the insulation.

The economies to be gained cannot be determined unless the insulation factor (k) is known. The chart shows an example using two-inch Fiberglas insulation where steam usage was reduced by almost 90 percent.

A technique for insulating tanks, stills, and kettles, developed over the past few years, involves covering the exposed surface with any one of a number of insulation materials and then permanently protecting it with an armored cladding. This is usually made of corrugated aluminum although asbestos-cement and stainless steel claddings have been used if local conditions prohibited use of aluminum.

Procedure

The first step is the laying down of 1½ in. roofing Fiberglas, which is secured to the roof deck by welded studs. Asphalt fabric membrane is then mopped on, followed by saturated felts or a spray coat of Insulmastic. This produces an impervious and resilient film that is capped with a gravel-stop non-ferrous flashing.



The Ohio Oil Company permanently insulated seven of its storage tanks at Robinson, Ill., three of which are shown here.

This insulation was installed only seven years ago. It has deteriorated and fallen off in large patches.

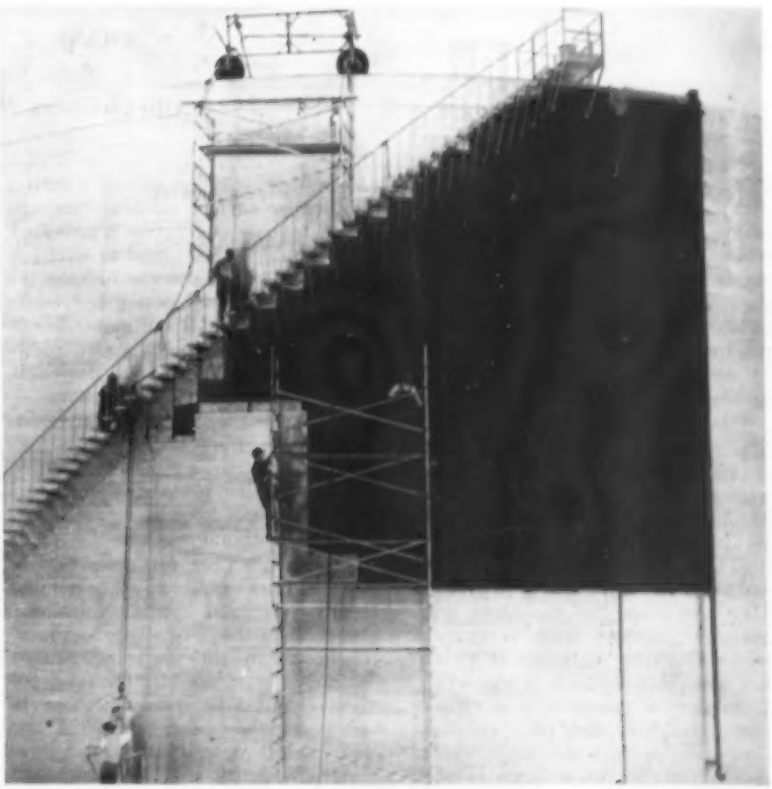
By comparison this tank is assured of permanent insulation by its attractive waterproof aluminum cladding.

Vertical Steel Channel sections are welded to the tank walls and shelf angles are welded between the channels. This prevents slumping of the insulation. Within these areas, the required insulation is applied. In low lying areas, a 12 in. base course of Foamglas is used since it is impervious to moisture. Sheets of the armor-cladding are now applied using special drive screws with neoprene seals to ensure water-tight joints. Specially designed flashings, flashing extrusions, and other water shields are placed at vulnerable points around the tank to make the installation completely watertight.

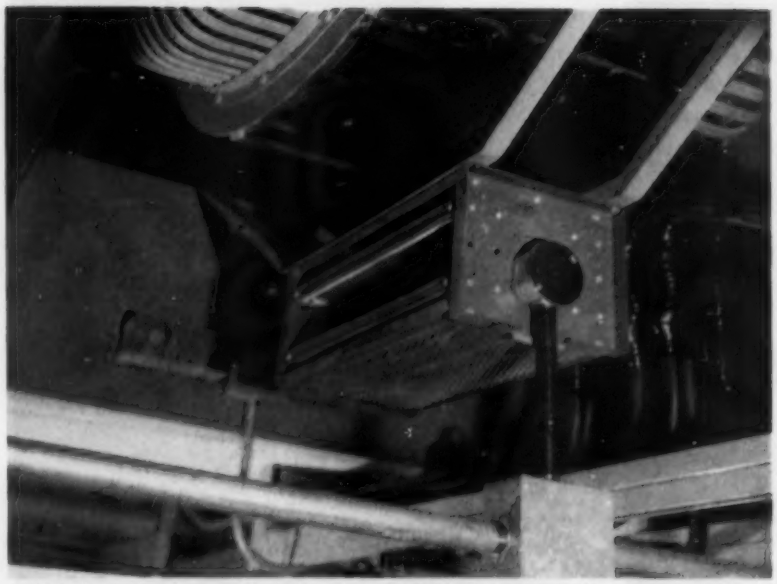
Result of Test

The value of the insulation can be judged from the results of an oil storage tank test at Chelsea, Mass. Insulated by Nicholson and Galloway, the tank was of 120 ft diameter and 48 ft high. It was heated to 135 F on June 26th and 55 days later on August 20th, its temperature had dropped only 41 degrees down to 94 F.

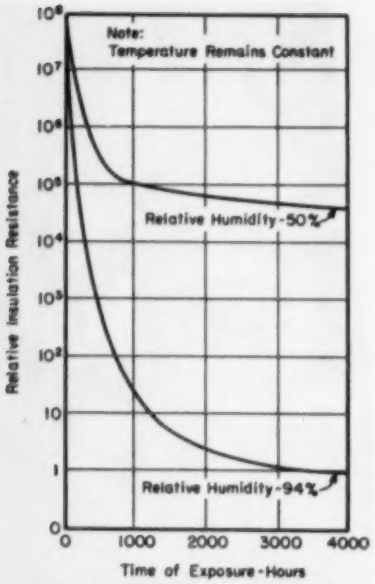
Modern application techniques have lowered installation costs for this permanent application to 50 percent of the installation costs using the old methods, which only yielded a life span of 5 to 10 years.



Installation is speeded up by the use of modern aluminum scaffolding and bosun's chairs. Protrusions like this stairway call for special treatment.



This is a worm's-eye view of an electric space heater installed underneath a 4000-hp wound-rotor motor. Heater keeps motor dry when it is shut down.



Insulation resistance drops greatly upon long exposure to high humidity.

When In Storage . . . .
Keep Your Motors Dry

I&P EXCLUSIVE

FRANK C. OSTERLAND, JR.
Motor-Generator Section
Allis-Chalmers Manufacturing Company

COST-CONSCIOUS plant engineers seldom have to be reminded of the necessity for in-service maintenance of electric motors and other rotating machinery. The same degree of care is not always given to idle equipment—whether it be new machines in storage, or motors out of service during plant remodeling or shutdown.

The Number One Enemy of an idle motor is moisture. Variations in ambient temperature combined with a moist atmosphere will result in condensation in or on the motor. If uncontrolled, condensation can lead to insulation failure or mechanical damage from rust or corrosion. The best place for machines temporarily removed from service, as well as for new machines, is a clean dry area with uniform temperature. Such general precautions as protection from dust, dirt, physical damage, or dripping water must not be overlooked. In the absence of such ideal storage conditions, some temporary covering can be substituted.

Moisture is always present in the atmosphere. Temperature cycling will cause surface condensation unless adequate ventilation is provided. Air should be permitted to circulate freely around the motor to keep the enclosure from becoming a "sweatbox." Of course, if the motor is encased in a completely sealed package and is protected by a dessicant, the seal should not be broken.

Moisture may collect on machine parts taken from storage when they are colder than room temperature. Allowing the parts to warm up gradually will keep such condensation at a minimum.

These practices for protection of idle motors apply to the popular totally enclosed types. No motor, even with the so-called "outdoor" enclosure, should ever be stored out-of-doors or stand idle for long periods of time in areas with uneven temperatures unless electrical and mechanical parts are protected. Even total enclosures will "breathe" during temperature cycling.

Insulation tends to absorb moisture, especially in idle machines. Enough moisture will reduce the insulation resistance below safe limits. In warm and humid climates, moisture can speed the growth of bacteria or fungi that attack and break down organic insulating materials.

A common method of combating moisture condensation in idle motors is the use of space heaters to keep the machine parts slightly above room temperature. Although a winding temperature about 5 C above the ambient is usually sufficient, a higher temperature may be desirable where wide and rapid temperature changes are expected.

The amount of heat necessary to raise the winding temperature about 5 C above the ambient is easily determined through use of a formula:

$$H = \frac{DL}{35}$$

where H = heat power (kw),
D = machine end-bell diameter (feet), and
L = machine stator length between end-bell centers (feet).

This formula applies where the ma-

chine is closed except for a small vent at the top and bottom for air recirculation. If the heaters are to be effective, the minimum temperature at any place within the machine enclosure must be maintained above that of the surrounding air.

Considerable air movement and wide temperature variations will result from "stack effect" in vertical motors and in others with special top- or duct-ventilated design. Idle machines outdoors in weather-protected enclosures will be ventilated by winds causing either suction or pressure on the vents. Such motors may require as much as 50 percent more heater capacity than is indicated by the formula.

Electric space heaters are usually the most convenient and safe source of heat. They are available in many sizes, and can be placed in service quickly. Operating cost is low. Some motors are equipped with built-in space heaters that can be energized during idle periods.

Insulation Resistance

Insulation resistance tests should be made on all machines, old or new, when they are installed. Where machines are being shut down, resistance measurements should be made before the motor winding temperature drops to room temperature. Comparison between these readings and others made during the shutdown period will help determine the extent of resistance drop due to moisture absorption.

Moisture is not the only factor affecting insulation resistance. Also to be considered are changes in temperature, the cleanliness and age of the windings, and the length of time that test voltages are applied.

Some experience and judgment is required for proper evaluation of the factors influencing the need for drying out motors. Small, low-voltage machines are usually placed in service without drying out if they have not been unduly exposed to moisture conditions. It is advisable, however, to be sure that the insulation resistance and polarization index of the windings are equal to or above the "standard value" of insulation resistances, as recommended in AIEE Standard No. 43. Larger, high-voltage machines are usually dried out before being placed in service, even though they may not seem to require it.

Mechanical Parts

Mechanical motor parts, especially bearings and journals, must also be protected against moisture damage. Motor manufacturers make adequate provisions for lubrication of these surfaces during operation, but protective films can be easily lost during shutdowns. Rust and corrosion follow. This is especially true of sleeve bearings. Anti-friction bearings are packed with grease and are ready to operate when they leave the factory. They usually require little attention, except periodic relubrication.

There is ample evidence that the threat to bearing surfaces is not fully appreciated. It is not unusual to find motors improperly protected against moisture damage, without oil in reservoirs, and without space heater protection. Re-plating a shaft journal is expensive and time consuming. It can be avoided with proper precaution.

Most industrial motors are shipped completely assembled. Bearing parts are generally protected against rust during shipment and for a reasonable time awaiting installation. When weeks and months elapse before a motor is placed in service, additional precautions are necessary.

Properly applied, commercial rust preventives will protect clean metal surfaces against moisture damage. Some of these have the advantage of requiring no special cleansing procedure before the machine is placed in service. The compound may be added through oil-ring inspection ports on horizontal machines. The shaft should be rotated at the same time to distribute the compound over the journal surfaces.

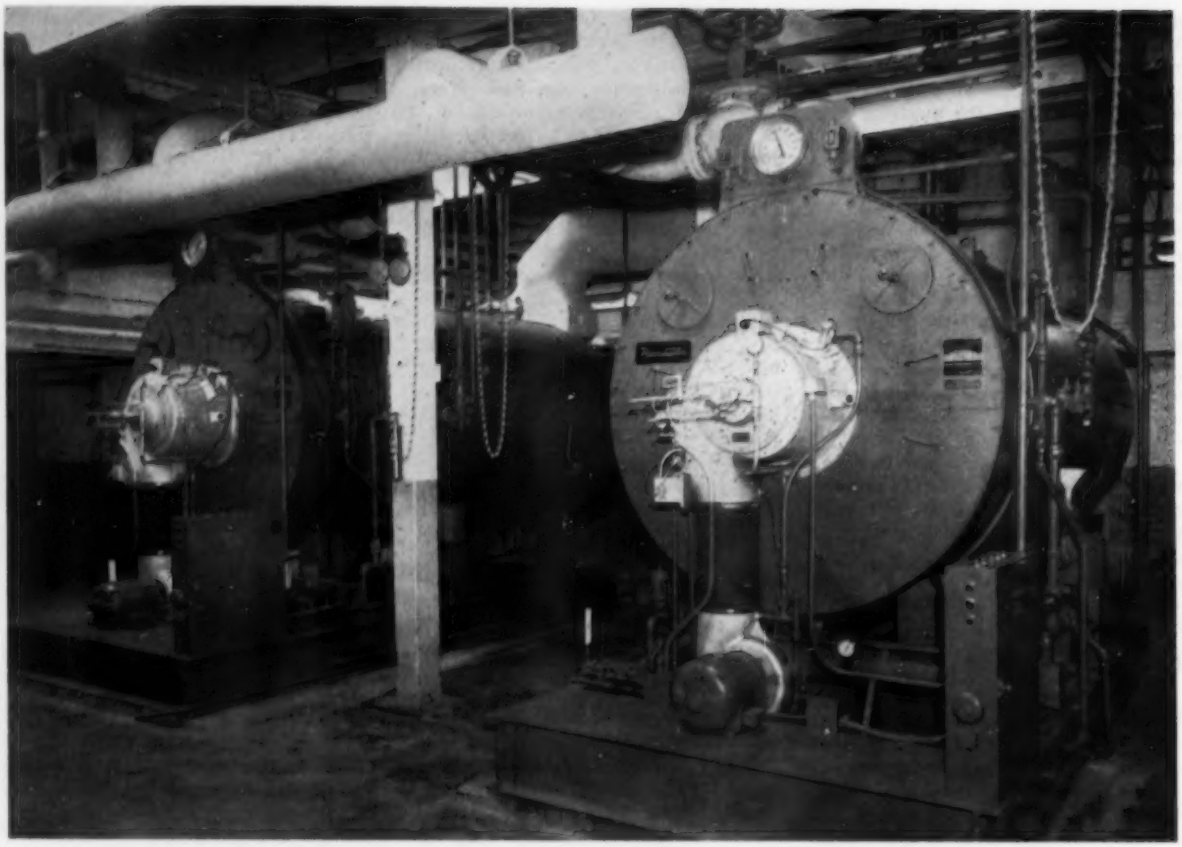
Another good precautionary measure is to fill the oil reservoir with the specified operating lubricant, after making sure that all surfaces are free of rust and dirt. Sleeve bearing motors stored in a heated, dry warehouse can be protected by filling the oil reservoir to the proper level and giving the shaft several revolutions at three-month intervals. However, if such motors are in outdoor storage, the interval should not exceed a week. For motors with anti-friction bearings, indoor storage requires shaft rotation at six-month intervals. Outdoor storage calls for monthly shaft rotation.

Periodic inspections will insure against damage to machines in long-term storage or storage in extreme moisture conditions. If oxidation is discovered, all trace of it should be removed. Additional rust preventive or lubricant then should be applied to bearing parts.

Set up a preventive maintenance program for idle as well as for operating motors to safeguard motor investment. Precautionary measures can assure that motors taken from storage are ready for service.

STORAGE PROGRAM FOR ELECTRIC MOTORS

	Before Storage	*During Storage*	*After Storage*
Storage	If possible, arrange for storage in clean, dry area with uniform temperature.	Keep motor surfaces clean and dry.	
Machine Inspection and Repair	Inspect machines temporarily removed from service and arrange for necessary work during downtime.	Put machines in first class condition.	Make sure units are in all respects ready for operation.
Insulation Resistance Readings	Make and record insulation resistance readings as index for future measurement.	Check insulation resistance monthly. Compare with prior readings for resistance drop and need for insulation dry-out.	Analyze insulation resistance readings and dry out if necessary.
Space Heaters	Provide and energize adequate space heaters.	Keep space heaters energized.	Arrange permanent space heater installation in machines subject to periodic shutdown.
Bearings	Inspect sleeve bearings for moisture or oxidation. Remove all traces of rust and fill bearing reservoirs with lubricating oil.	For sleeve bearings, rotate shaft several revolutions monthly during indoor storage or at least once a week during outdoor storage. For anti-friction bearings, rotate shafts at six-month intervals during indoor storage, monthly during outdoor storage.	Recheck bearing surfaces. Clean up if necessary. Flush and refill oil reservoirs.



The new installation includes two, 200-hp, heavy oil fired, three pass fire tube, Powermaster packaged automatic boilers.

We Cut Steam Costs in Half

I&P EXCLUSIVE

LOUIS H. DINNER
Plant Manager
Lackawanna Pants Mfg. Co.

T. MORGAN O'HORA
General Manager
Joseph F. O'Hora & Sons

LACKAWANNA Pants Mfg. Co. occupies a modern plant in Scranton, Pa., for the manufacture of Saxon men's dress slacks. This plant also does its own examining, sponging, shrinking, and decating of the cloth used for its trouser production. The nature of the processing load is such that an instantly and continuously variable quantity of high pressure steam is required eight hours per day throughout the year. During winter months, low pressure steam also is used for heating.

Previously steam for these requirements was purchased from a neighboring boiler plant. This service was costly, both in terms of actual dollar expenditure and in production difficulties. Because of the long supply lines and the variable load characteristics, steam quality was frequently poor, lengthening the time of certain operations and increasing maintenance of distribution system components.

Boiler Selection

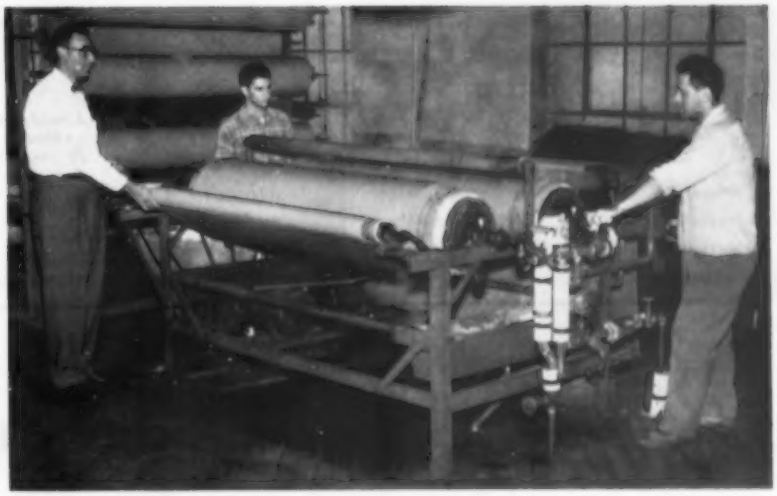
Study of the problem by Lackawanna engineers indicated in-plant steam generation was the most satisfactory solution, and two, 200-hp, Orr & Sembower, Powermaster packaged automatic boilers were installed. These units are of 150 psig design and burn No. 6 oil. They have internal furnaces and second and third passes of fire tubes, each pass designed for controlling the velocity of the cooling and contracting volume of flue gases. One boiler, operating at 85 to 95 psig, carries the entire load, while the other serves as a standby.

With multipass packaged automatic boilers where combustion must be accomplished in the confined chamber of an internal furnace, the burner design is particularly critical. It is necessary, both for cleanliness and economy, to maintain uniformly high efficiency at all intermediate firing rates. The burner must assure complete atomization despite changes in the viscosity of the oil to prevent coking on the burner and refractory throat. Therefore, these boilers are equipped with O&S air atomizing

TABLE 1—COMPARATIVE COSTS

	Previously Purchased Steam	*Current Fuel Costs*
January	$1940	$1085
February	1685	721
March	1790	743
April	1550	368
May	1375	261
June	1265	213
July	1015	145
August	1050	265
September	1070	282
October	1575	476
November	1595	654
December	1590	847
	$17500	$6060
*Expenses	—	2400
Total	$17500	$8460

*Annual miscellaneous expenses with in-plant steam generation include: insurance, labor, gas and electricity, routine maintenance and repairs.



Double spenging process is typical of the plant's widely variable steam loads.

burners, which provide excellent flame pattern and consistently clean combustion with all grades of oil from light to No. 6 oil.

Burner Details

In the O&S air atomizing burner, a beryllium copper body holds a stainless steel cap over multiple slots in a stainless steel core, forming converging flow paths for the atomizing air. Only about one percent of the total full load combustion air is admitted with the oil for atomization. This permits extremely close control of the combustion air from the blower and results in high efficiency at light loads.

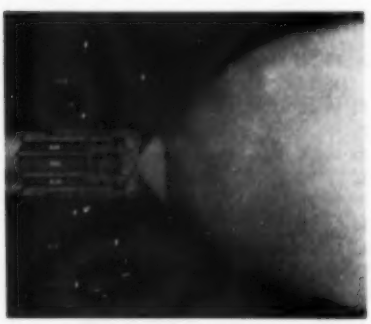
Fuel oil flows through a central oil tube and is picked up at the multiple injection points by individual air streams. Atomizing air from the annular space remaining within the outer tube is introduced into the combustion chamber across the oil streams through converging tangential slots machined accurately in the nozzle core. The dams near the end of the oil tube prevent dripping and carbonizing after shutdown, thus minimizing cleaning and maintenance costs. The beryllium copper body and the brass air tube conduct heat back to the plenum where it can be quickly dissipated at low temperature.

Fuel-Air Ratio Control

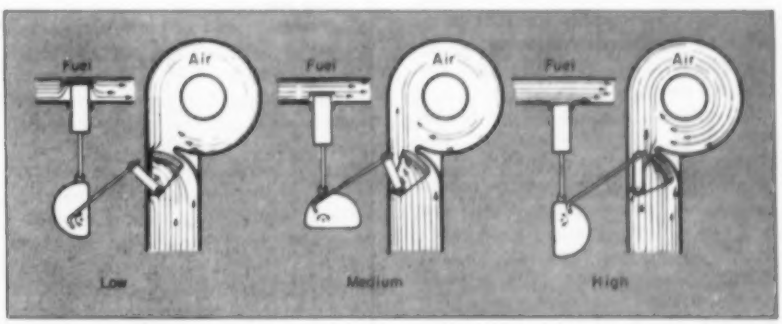
Fuel and air ratio to the air atomizing oil burners is correctly proportioned for uniform efficiency at all intermediate points from maximum firing rate down to 20 percent of full load by a pressure controlled potentiometer. This unit positions the damper motor, which adjusts the fuel valve and air damper, according to steam demand as reflected by boiler pressure. The operating mechanisms are an adjustable cam which positions the fuel valve and an adjustable linkage which positions the air damper.

Control system adjustments are set and locked during factory firetesting while checking against actual flue gas analyses and stack temperatures at a large number of check points. During actual operation both fuel and air at any specific firing rate are correctly proportioned for efficient operation with correct CO_2 content and stack temperature of the flue gas. The arrangement is completely coordinated in engineering detail and is extremely flexible.

Comparative operating costs, shown in Table 1, provide ample evidence of the success of the installation. Previously, purchased steam for a typical year cost $17,500. The annual cost of steam now amounts to only $8460—less than half of the previous cost and more than $9000 yearly savings. Steam quality is reported as considerably improved with hotter and drier steam available from the packaged boilers than previously supplied through the long lines required from the neighboring boiler room.



Cutaway of the air atomizing burner.



Details of the adjustable cam and damper linkage for fuel-air ratio control.

TABLE 1 — RECOMMENDED VELOCITIES FOR VARIOUS REFRIGERANTS

Refrigerant	Suction line velocity ft per min	Discharge line velocity ft per min	Liquid line velocity ft per min	Suction line pressure drop psi	Discharge line pressure drop psi
Ammonia	2000 to 4000	4000 to 10000	150	1 to 1½	1 to 4
Freon-12	500 to 3000	2000 to 3500	150	1 to 3	3 to 5
Methyl chloride	500 to 6000	2000 to 4000	150	1 to 3	3 to 5
Carbon dioxide	1000 to 2500	1000 to 3000	250 to 450	1 to 2	1 to 3

Efficiency of Refrigeration Piping

LEO WALTER
Consulting Engineer
Cheltenham, England

I&P EXCLUSIVE

CORRECT SIZING and installation is important for the efficient and economical operation of refrigeration piping. While in many instances the first installation cost of suction and discharge piping is only a fraction of the total cost of a refrigeration plant, the use of inferior piping material and poor installation techniques can add considerably to operating costs. For example, yearly plant operating costs can be increased as much as 30 percent by excessive pressure drops caused by wrong pipe sizing.

As the total resistance of refrigerant piping is a function of compressor tonnage, vapor velocity, total straight pipe length, shape and number of pipe bends, and size of pipe, there are many details to be examined in a new piping layout. In Table 1 are recommended velocities for various refrigerants, although these values must necessarily be revised to take into account specific local conditions. In this table, the common allowable pressure drops are also tabulated. Assuming an allowable fluid velocity, the pipe size can be checked.

In general, a good piping layout will show short suction and discharge lines with a minimum of bends. Very long suction lines have large heat losses, apart from flow resistance, and should be avoided. The use of stop valves having straight through flow with a small pressure loss is advantageous. For a quick check of pipe size, Table 2 gives recommended values if the compressor tonnage is known. A detailed check requires more comprehensive calculations.

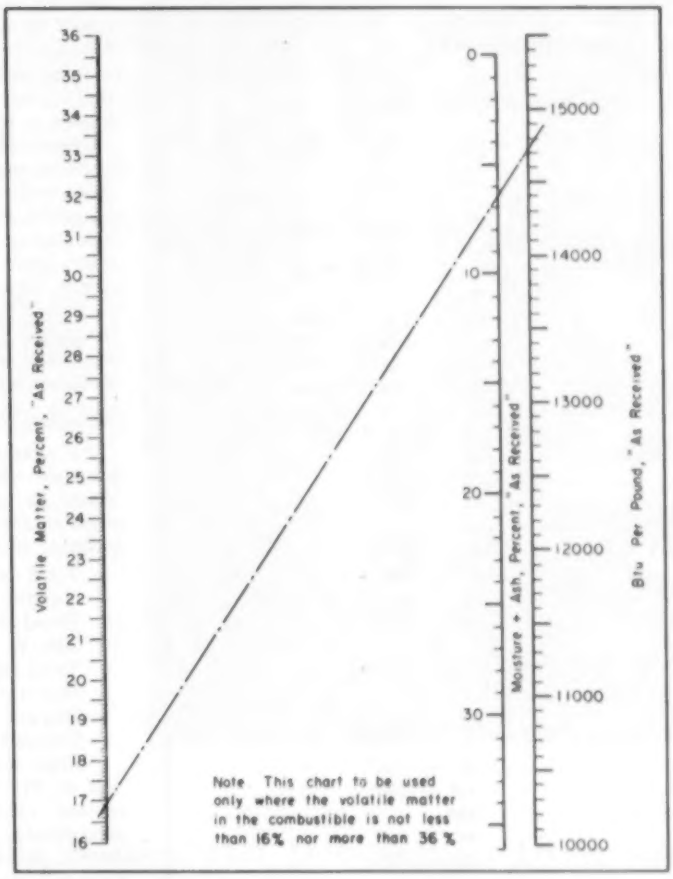
Users of older refrigeration plants are not always aware that they may be operating at avoidable higher annual running costs of from 5 to 10 percent because the suction and discharge piping from the compressors was made undersize in the original installation.

Whenever it appears that a refrigeration system has excessive operating costs, it is advisable to call in an expert. Replacement of a tight piping system is not only an expensive job but requires the interruption of plant operations. One alternative, where a compressor cannot efficiently handle the load, is to install an additional smaller machine. Sometimes, the same result can be achieved by increasing the size of the suction and discharge pipes of the existing compressor and thus increasing its capacity.

Where it has been established that the compressor plant is adequate and excessive pressure drops are caused by too high velocities in undersized piping, the only solution is to reconstruct the system. In rebuilding the piping, short straight runs of pipe with large radius bends with adequate pipe diameters should be used.

TABLE 2 — RECOMMENDED LIQUID LINE SIZES

Nominal pipe size inches	Refrigerant used and system tonnage		
	Ammonia	Methyl chloride	Carbon dioxide
½	6 to 13	up to 2.5	up to 3
¾	14 to 35	3 to 10	4 to 10
1	36 to 70	11 to 25	11 to 27
1¼	71 to 115	26 to 37	28 to 45
1½	116 to 170	38 to 55	46 to 95
2	171 to 295	56 to 95	96 to 145
2½	296 to 420	96 to 155	146 to 220
3	421 to 645	156 to 225	221 to 295
3½	646 to 895	226 to 295	296 to 395
4	896 to 1150	296 to 395	396 to 595
5	—	396 to 600	596 to 895
6	—	—	896 to 1250


Volatile Matter, Percent, "As Received"
Moisture + Ash, Percent, "As Received"
Btu Per Pound, "As Received"
Note This chart to be used only where the volatile matter in the combustible is not less than 16% nor more than 36 %

Correction Table for Estimating Heating Value of Coal

VIC MOOZA, Director, Hampton Roads Testing Laboratories

I&P EXCLUSIVE

A NOMOGRAPH CHART by Thomas H. Duffy dealing with the "Estimated Heating Value of Coal" was published in the February 1954, issue of INDUSTRY AND POWER. This chart has been in use at a coal testing laboratory for the past several years with great success. In order to adopt this convenient chart for practical laboratory use, it became necessary to develop a table as an addendum, so that the results obtained could be applied to a wide variety of bituminous coals.

This combination of nomograph chart and table has become a practical tool for the coal testing laboratory director so that the proximate analysis of coal submitted by the chemist can be quickly verified. This nomograph-table combination has effectively reduced that ever present "human-error" element.

Before applying the nomograph to everyday laboratory use, we gave consideration to two factors; first the validity of the nomograph interpretations against actual laboratory run analyses, and second, development of an appropriate correction for coals having a free swelling index (ASTM) of less than number 9.

To find this correction value, about 1000 actual laboratory analyses were chosen and these were classified into groups with volatile matter contents in steps of five percent differential. All had a free swelling index of 9. By arithmetical interpolation each of the analyses within the 5 percent group was converted to show the corresponding adjusted Btu equivalent. These adjusted Btu equivalents were then averaged, and the average Btu thus obtained was sub-

CORRECTION TABLE

Heating Value	Percent Volatile Matter					
Btu per lb	15	20	25	30	35	37
12,600	...	...	...	–60*	...	...
13,700	...	–75*	...	...	...	...
13,900	...	...	...	None	None	...
14,000	...	None	None	...	...	...
14,200	...	...	None	None	None	...
14,300	–70*	...	–75	...	...	...
14,400	...	...	–40	+40	+40	...
14,500	–100*	–30	None	+75	+70	None
14,600	–70	None	+50	+60	+90	...
14,650	–50	None	+70	+80	+100	...
14,700	–50	+70	+80	+100	...	...
14,750	None	+60	+70	+50	...	...
14,800	+40	+40	+80	+50	...	...
14,850	+40	+30	+70	+50	...	...
14,900	+30	+50	+60	+70	...	...
14,950	...	+25	+50	+30	...	...
15,000	...	+20	+45	+20	...	...
15,100	...	+25	+55	+40	...	...
15,200	...	+30	+80	+60	...	...
15,300	...	...	+100*	+100*	...	...

*–Correction factors based on one analysis.

Approximate Free Swelling Index Corrections

Number 8	–70 to –150
Number 7	–125 to –300
Number 6	–280
Number 3	–350
Number 1	–500 to –850

tracted from the corresponding Btu equivalent as obtained from the nomograph chart. This differential thus establishes a correction to the nomograph chart for coals having a free swelling index of 9, in each particular volatile matter grouping. This procedure was followed for each group and tabulated as shown in the correction table.

Lower Indexes

Up to this point we are limited to coals having a free swelling index of 9. Laboratory experience has shown that the free swelling index of coal affects the Btu value. A high free swelling index shows that a maximum Btu content can be expected for a particular classification of coal, and conversely a low free swelling index reflects a lower Btu content. As might be expected, there are some coals originating near the outcrop of the coal vein that have a low degree of free swelling index. This outcrop, being subjected to moisture in the form of rainfall that contains dissolved oxygen from the air, tends to become oxidized. This lowers the Btu content and also lowers the free swelling index. There are some coals, however, that cannot be classified as outcrop and yet they possess a low free swelling index inherently.

Effect on Coal

To correlate the numerical effect that the free swelling index has on coal, a large number of laboratory run coal analyses were grouped by their degree of free swelling index and these Btu results compared with the same classification of coal having a free swelling index of 9. Therefore, by arithmetical difference of the two Btu contents, a numerical value was established that is the degree of Btu effect reflected by the lower free swelling index. From this laboratory correlation it was found that there were some variations in the numerical values obtained. They are expressed in the table, therefore, as limits. The somewhat wide variations in the numerical values of coals with free swelling index numbers of 8, 7, and 1 decreases the degree of accuracy for verification of an analytical result in this group, but otherwise for coals having a free swelling index of 9 the verification remains substantially good. If the coal in question is known to have a free swelling index characteristic because of oxidized outcrop, then the upper limit of the free swelling index correction is appropriate, but if the free swelling index is of an inherent nature, then the lower limit would be used. Fortunately, bituminous coals that are an exception to the rule do not occur so frequently in the course of laboratory analytical determinations of coals. Yet they are known to exist.

Example Calculation

An example problem may illustrate the use of the nomograph and chart. Assume a laboratory proximate analysis of dry coal with a free swelling index of less than 9.

Total moisture, %	0
Volatile Matter, %	16.95
Fixed carbon, %	76.39
Ash, %	6.66
Total, %	100.00
Sulfur, %	.49
Btu per lb.	14,674
Calories per gram	8152
Free swelling index	8

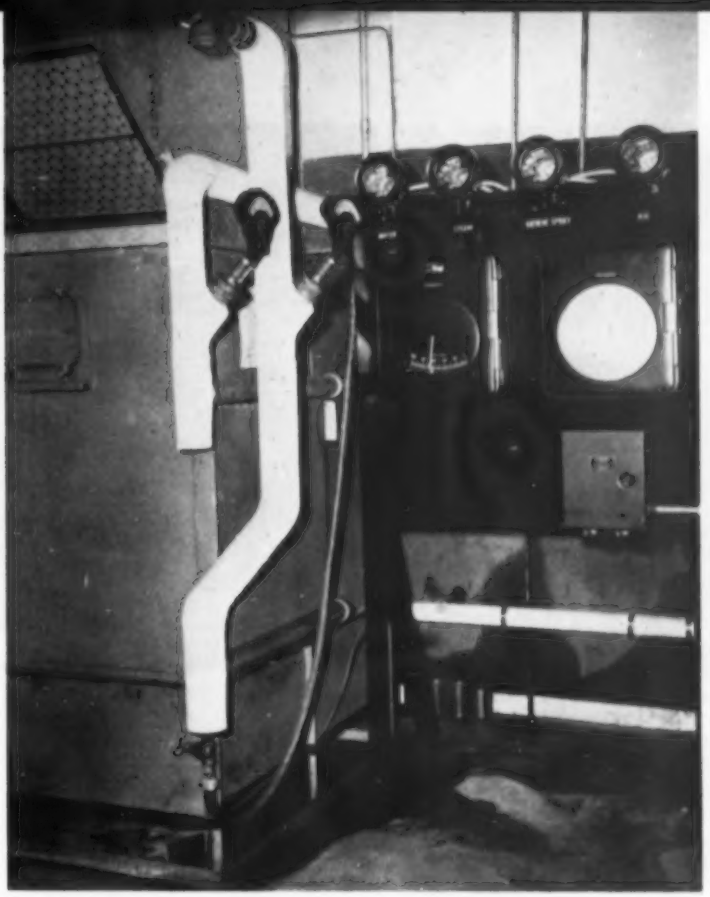
If on Fig. 1, the dry coal volatile matter (16.95) is lined up by a straightedge with the dry coal ash (6.66), and the line is extended, it intersects the Btu scale at 14,740 Btu. Referring to Fig. 2 at 14,750 Btu (nearest to 14,740 on the Correction Chart), if the volatile matter were 15 then the correction would show as zero Btu, and if the volatile matter were 20 then the correction would be +60 Btu. Since in this example the volatile matter is 16.95 we must interpolate between the 15 and 20 percent volatile matter correction. This interpolation shows as follows:

Volatile Matter		Btu Correction
15	—	Zero
16.95	then	+23
20	—	+60

This correction of +23 Btu is to be added to the original 14,740 Btu reading taken from Fig. 1. Thus, 14,740 + 23 = 14,763. The free swelling index (8) correction of –70 Btu must then be considered. Subtracting the free swelling index correction, we find that the final laboratory Btu should be in the order of:

14,763 – 70 = 14,693 Dry Coal

Since our laboratory determination shows 14,674 Btu as against 14,693 expected by the Corrected Chart readings, then the difference of 19 Btu is considered a satisfactory verification of the analytical results.



Separate penthouses on the roof adjacent to the dehydration oven contain air conditioning equipment and heating coils. The photo at right shows the contactor section of the dehumidifying unit and the instruments and controls.

Dehumidification System and Dehydration Oven Are

Solving Drying Problem at Westinghouse

E. A. WINDHAM
New York District Manager, Kathabar Division
Surface Combustion Corporation

MOISTURE rates high on the danger list for refrigeration systems. Entrapped water vapor in sealed refrigeration systems can cause erratic operation due to freezing of the moisture at the place of refrigerant expansion. It also speeds chemical reactions leading to breakdown of the refrigerant and the oil.

Assembly Problems

Prevention of this water vapor entrapment begins with the basic equipment manufacturer. The oil and refrigerant must be dry so that moisture will not be added when the unit is charged. The parts that make up a refrigeration system must be dry when they are assembled. These parts then must be sealed quickly to prevent the reintroduction of moisture.

Realizing the importance of this equipment drying operation, the Westinghouse Electric Corporation's Springfield, Massachusetts plant has been constantly seeking a better drying method, consistent with cost limitations. Just recently a batch drying operation was replaced with a newly developed system that combines air dehumidification and a continuous dehydration oven. Significant cost savings have been realized with this new method through the reduction in handling, manpower requirements, and the acceleration of the process itself.

Before the present method was developed, complete assemblies were dried in a batch operation. Eight complete units — compressor, evaporator, and condenser all assembled — were hooked up in series and manually loaded into each of thirty batch ovens. Atmospheric air at 285 F was circulated through the ovens. Dry air at 15 psig and a dewpoint of −75 F was circulated through the eight units in series. While results with this arrangement were satisfactory, the Westinghouse design engineering department determined that separate parts drying, rather than complete assembly drying, was more desirable.

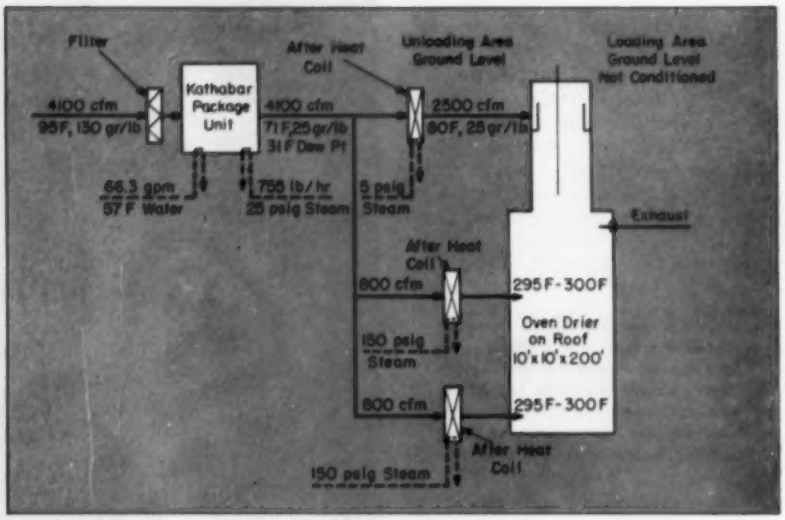
New Dehydration Oven

Two principal elements are used with the new method. The first is the dehydration oven itself, and the

second is the air drying system. As in most every industrial plant, adequate floor space for the new continuous oven — approximately 10-ft wide x 10-ft high x 200-ft long — was difficult to find. Space occupied by the thirty batch ovens was urgently needed for other uses. For this reason, the oven was designed for installation on the roof of the building. It is constructed of insulated sheet steel panels. A supply and return leg, like the bottom half of the letter "L" connects the oven with the loading and unloading areas at ground level in the parts processing area. This leg is formed by a 4-in. x 4-in. x ¼-in. angle frame that is covered with 18-gage sheet steel panels.

Oven Capacity

During the operating cycle, the compressor assemblies and covers are loaded onto fixtures and positioned on a loading shelf. As the horizontal bars progress upward, via a chain drive, the fixtures are engaged and the parts drawn up into the oven. The rise from ground level is approximately 30 feet, and conveyor speed is 16 inches per minute. The oven holds 1356 fixtures, and when operating at full capacity, 190 units and covers or end heads can be dried per hour. The entire drying cycle — passing the assemblies through the dryer, applying of covers, and welding the end heads in place—takes six hours.



Schematic flow diagram shows arrangement of the complete air drying system.

Air Drying System

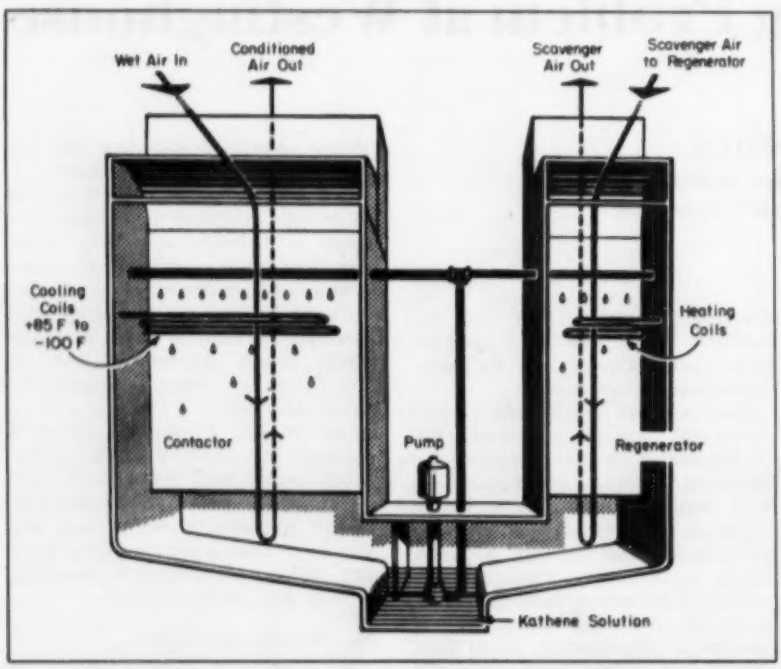
The central unit in the air conditioning system, which supplies dehumidified air to this dryer, is a Kathabar package unit manufactured by Surface Combustion Corporation of Toledo, Ohio. The accompanying schematic flow diagram provides details of this air supply system based on maximum design conditions. As indicated, 4100 cfm of outside air at conditions of 95 F and 130 grains per pound is brought into the system. After this air is filtered, it passes through the dehumidification unit, where the moisture content is reduced to 25 grains per pound, a dewpoint of 31 F.

Dehumidified air then is distributed to two separate systems. The first system takes 2500 cfm of air. By passing it through an afterheat coil, the air is heated to a comfort air conditioning temperature of 80 F with 5 psig steam. This air is supplied as a blanket around the oven unloading area, protecting the dried components until the covers can be tapped on and immediately welded in place. The balance of the air, 1600 cfm, passes into a separate system and is supplied in two equal portions into the oven itself. Before delivery, this air is heated with 150 psig steam in afterheat coils to between 295 and 300 F.

Dehumidifier Operation

Operation of the dehumidifier unit is simple and automatic. The total 4100 cfm air volume first enters the air washer or contactor section of the unit. In this section it contacts a flood of the dehumidifying medium, a lithium chloride base solution. Air and lithium chloride solution, in intimate contact, pass over extended surface cooling coils.

The amount of moisture the lithium chloride solution will absorb from the air stream is inversely proportional to its temperature. Thus, the coolant used in these coils automatically establishes the amount of



Cutaway view of the Kathabar unit shows relative locations of the contactor section, sump for the lithium chloride solution, and the regenerator section.

Compressor units (above) and covers are dried at a rate of 190 per hour.

Right. Photograph shows the loading area for the new dehydration oven.

dehumidification to be done. As shown in the flow diagram, it also cools the air to 71 F. In this system, maximum coolant demand is 66.3 gpm of available 57 F city water. When entering air conditions are less than design maximum, coolant flow is reduced automatically.

After passing over the coils, the dried air goes into the distribution system, and the absorbent solution falls into a sump at the base of the unit. A ¾-hp pump automatically lifts the solution from the sump back to the flooding nozzles in the contactor section for additional dehumidification passes. At the same time, this pump delivers about 10 to 15 percent of the solution to a separate, smaller section of the assembly that is called a regenerator.

Regenerator Operation

The cycle in the regenerator is similar to that found in the contactor section. Intermittently, when the solution in the sump becomes diluted a valve is opened directing 25 psig steam into the coils of the regenerator section. The solution sprayed in this chamber is forced to give up the absorbed moisture as its temperature rises. The released moisture then is entrained by a scavenger air stream and vented to the outside, while the reconcentrated solution falls, once again, into the sump. Power consumption is nominal since the regenerator fan requires only a 1-hp motor.

Regenerator Steam Demand

As soon as the sump level returns to a predetermined point, the steam valve is closed and the regeneration cycle is stopped. Maximum steam demand on this system is 755 lb per hr at 25 psig. The unit has only two moving parts, the regenerator fan and the sump pump. The wide range of turndown based directly on actual demand, low horsepower requirement, and the need for only routine maintenance has made possible very efficient, yet economical operation of the system.

External appearance of the contactor section of the dehumidifier unit installed at the Westinghouse plant is shown in the photograph. To save additional valuable plant space, the air conditioning equipment and the heating coils that serve the dehydration oven are placed in separate penthouses on the building roof next to the dryer. The photograph also shows some of the control instruments that regulate and record the automatic phases of operation of the contactor and regenerator sections of the system.

The dehumidification system supplies 2500 cfm of low dewpoint air to this unloading area to protect assemblies until they can be covered and welded.

ideas in action

. . . in U. S. industrial plants

Standardization of Pumps Proposed by Chemical Industry

A comparison of low pressure centrifugal pumps used by the chemical industry has shown that many dimensions differ only to slight degree and for no obvious functional reasons and that certain features of the pumps will lend themselves to standardization without impairing the manufacturer's competitive position, according to a survey conducted by the Chemical Industry Advisory Board.

The Board—estimating that the chemical industry alone could save over $6½ million annually through standardization of centrifugal pumps—has drawn up a proposal now being circulated by the American Standard Association.

Invitations have been issued by ASA to 30 national organizations representing designers, users, and manufacturers asking them to send representatives to a national conference to be held in April in New York City. The conference will decide whether a standards project should be initiated and a committee formed representing all parties-at-interest to work out the technical content of the standards.

The proposal made to ASA by the Chemical Industry Advisory Board dealt with low pressure centrifugal pumps used exclusively by the chemical industry—those broadly classified as horizontal, end-suction, single-stage, and electric driven. The approximate maximum capacity range is from five to 1000 gpm at temperatures to 500 F.

Benefits anticipated by the Board are:

Important monetary savings to the chemical industry because of lower replacement costs due to dimensional interchangeability, reduction in capital investment for new construction through reduction in design time, construction labor, and storeroom space, and decreased maintenance costs because of certain standardized features;

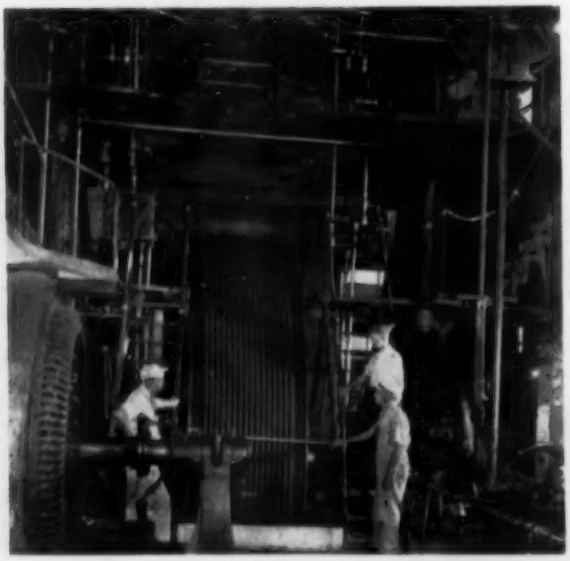
Savings to pump manufacturers through uniform specifications and the elimination of many special requirements;

Reduction in manpower requirements and consumption of essential materials;

A clearer understanding of each other's problems through the exchange of information between manufacturer and user.

The invitation went to national organizations prominent in the following industrial fields: pumps and accessories, valves and fittings, chemicals, pharmaceuticals, plastics, rubber, petroleum, paints, soaps and glycerin, pulp and paper. Also included were the engineering and testing societies concerned, materials suppliers, the Atomic Energy Commission, and military services responsible for the construction and maintenance of government-owned chemical plants and arsenals.

The ASA invitation is open to all vitally concerned with the use and manufacture of centrifugal pumps. For further information write to American Standards Association, 70 E. 45th St., N.Y. 17, N. Y.



1901 STEAM ENGINE

This Allis-Chalmers vertical cross-compound Reynolds-Corliss steam engine built in 1901 is still in use as a main drive to saw logs at Lee Tidewater Cypress Co., in Fla., where it was installed in 1913. Left front is a Bullock generator built in 1904 and rated 133 amp, 440 v, 3-phase, 277 rpm. The Bullock Co., purchased by Allis-Chalmers in 1904, is now A-C's Norwood Works.

Seven New Electrical Code Interpretations are Released

The National Fire Protection Association has released seven additional official interpretations of the 1953 National Electrical Code (see I&P, Dec., '54, p. 86). Subjects covered include use of snap switches, isolating switches, anesthetizing locations and storage rooms, use of open type fixtures, multiple fusing of motor circuits, construction of parallel cords, and autotransformers.

Interpretation No. 397

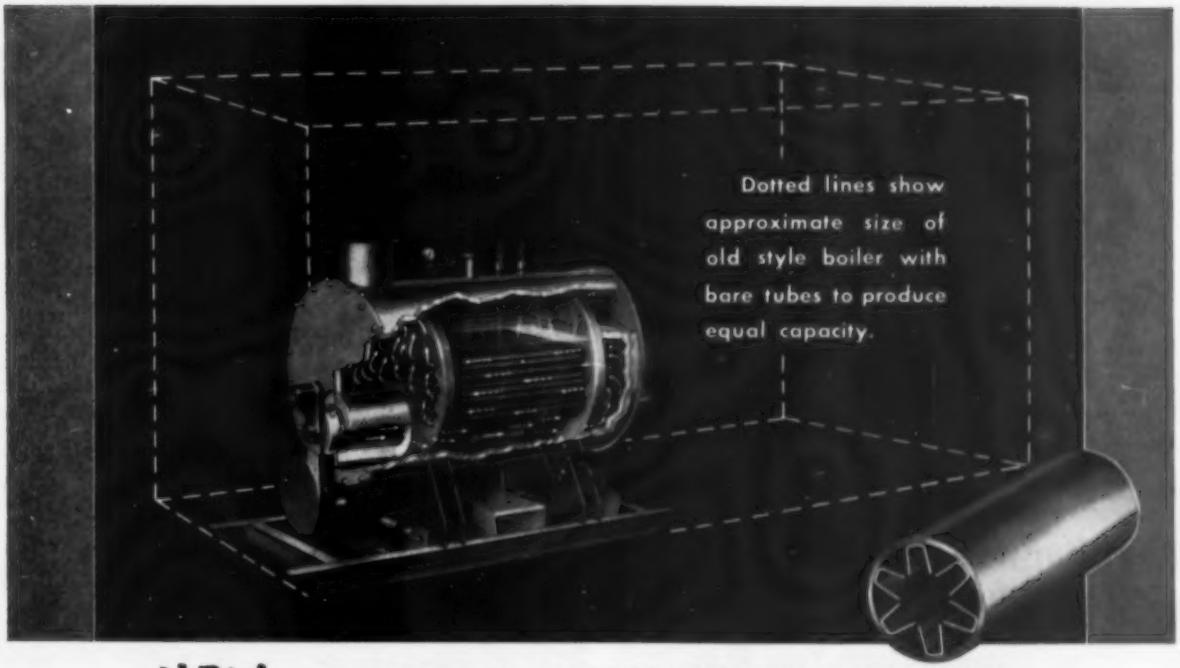
Sections 3814 and 4383-b: Snap Switches, Use of

Q. No. 1—Do general use, ac, snap switches at full load current rating on tungsten filament lamp loads comply with the intent of paragraph b of Section 3814?

A.—Yes

Q. No. 2—If an a-c rated, general use snap switch, which is tested at a power factor of 40% to 50% with the current at 480% of its full load current rating, is used as the control of a stationary motor of 2 hp or less, must it meet the requirements of paragraph b of Section 4383 or may it be used to control a motor having a full load current equal to the switch rating?

A.—It may not be used to control a motor having a full load current equal to the switch rating, but it



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uses *Internally Finned* boiler tubes

to produce more steam from much less space

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Our internally finned tubes have 3 times more fire-side surface than plain bare tubes, to pick up heat and transfer it to the water; create greater turbulence; and bring the hot gases in more intimate contact with the heat transfer surface. Consequently, we extract the maximum amount of heat, consistent with good combustion practice, in just *one pass* through a *short tube* — thus eliminating the need for big, heavy assemblies, and reducing the forced draft and stack requirements.

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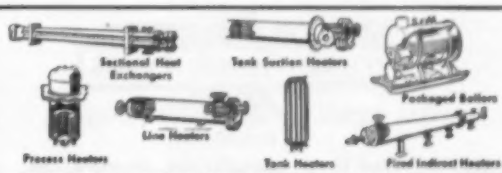

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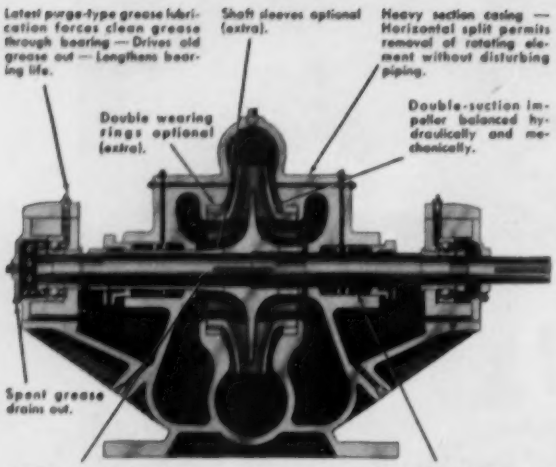

Latest purge-type grease lubrication forces clean grease through bearing — Drives old grease out — Lengthens bearing life.
Shaft sleeves optional (extra).
Heavy section casing — Horizontal split permits removal of rotating element without disturbing piping.
Double wearing rings optional (extra).
Double-suction impeller balanced hydraulically and mechanically.
Spent grease drains out.

Stainless steel shaft without sleeves is standard.

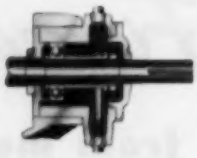
Extra-deep stuffing boxes take either conventional packing or mechanical seals.

New Purge-type Grease Lubrication

CUTS PUMPING COSTS

on American-Marsh Type HLM and HIM Split Case Centrifugals

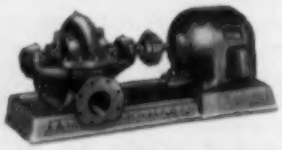
What does Purge-type Grease Lubrication offer you? Just this: By pushing out spent or dirty grease every time bearing is lubricated, it adds years of extra bearing service. That means less maintenance and longer pumping service from your total investment.



Ring-oiling ball bearings are also available (optional).

Many other superbly engineered features combine to eliminate interruptions and cut costs for A-M owners. Study the drawing a moment — You'll notice extra deep stuffing boxes and other details that are better designed, better built than ordinary pumps.

Then write for new HLM-HIM Bulletin 350, with full details and performance data.



HLM and HIM pumps are famous for low-cost service.

Pumps and Pumps only Since 1873

AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

In Canada:

American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC.

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ideas in action

—Starts on page 62

may be used to control a motor having a full load current rating equal to 80 percent of the switch rating.

Interpretation No. 408

Section 2390; Isolating Switches

Statement:—A metal-enclosed factory-built cubicle is installed in a vault and constitutes the service equipment to a privately owned building. A 13,200 v service goes through a circuit breaker which does not disconnect the service from the cubicle. The cubicle is fixed in position, but the circuit breaker is so interlocked that the breaker must be in the open position before it can be removed from the cubicle for inspection or servicing.

Q.—Does Section 2390 require an air break isolating switch in the incoming service line ahead of the service circuit breaker?

A.—No

Interpretation No. 410

Section 5135; Anesthetizing Locations and Anesthetic Storage Rooms

Q. No. 1—Section 5135-b-1—May a room or space in which combustible anesthetics or volatile flammable disinfecting agents are stored and which in this sub-paragraph is declared a Class I, Division 1 location in its entirety, but which is not located in areas described in a-2 of this Section, be supplied from the grounded supply system?

A.—Yes

Q. No. 2—Section 5135-a-2—Does the term "Anesthetizing location" as found in this sub-paragraph mean the entire location up to the ceiling height?

A.—Yes—See 5135-b-2 also.

Q. No. 3—Section 5135-f-1—Do transformers used to supply the ungrounded distribution system called for in this sub-paragraph mean any type of two coil transformer so long as there is no electrical connection between the primary and secondary windings?

A.—No—See 5135-f-2

Q. No. 4—Section 5135-h-2—Does X-ray equipment installed or operated in an anesthetizing location, as defined in sub-paragraph a-2 of this Section, have to be supplied from the isolated ungrounded system?

A.—Yes

Q. No. 5—Section 5135-h-2—Must the circuit supplying a portable X-ray, used within the hazardous area of an anesthetizing location, be served from an isolating type transformer if the receptacle supplying the X-ray is located outside the hazardous area?

A.—Yes

Q No. 6 — Section 5135-f-1 — Do all circuits, including circuits to fixed ceiling mounted lighting fixtures and suspended surgical fixtures, have to be supplied from the ungrounded distribution system?

A.—Yes

Interpretation No. 411

Section 5101-f; Use of Open Type Fixtures

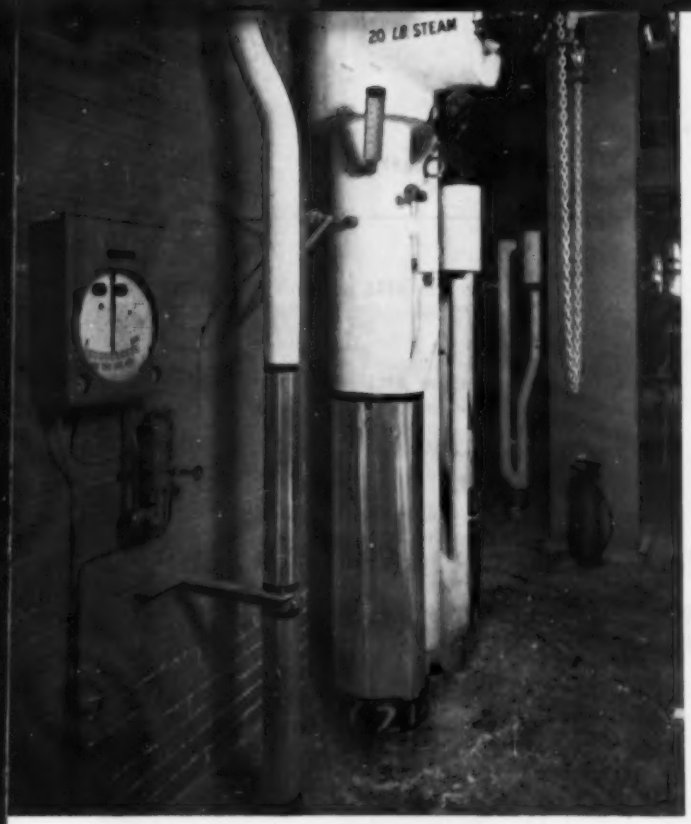
Q.—In an open-type of multi-story parking garage, the floors of which are classified as a hazardous area, may open-type fluorescent lamps without suitable guards or screens to prevent the escape of sparks or hot metal, be mounted less than 12 feet above the floor?

A.—No

Interpretation No. 412

Section 2411; Multiple Fusing of Motor Circuits

Circle 527 on Reply Card for more data



PROBLEM: High maintenance cost of canvas jacketing. High-pressure hot water hose used to clean floor damaged lower ends of lines and necessitated constant replacement.

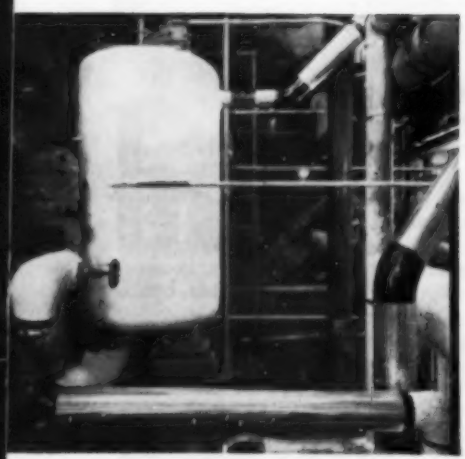
SOLUTION: Childers Aluminum Jacketing replaced canvas. Waterproof—easy to install—reusable.

PROBLEM: Extreme hazard of fire from static electricity generated in machinery. Canvas jacketing could burn easily causing danger to men and machinery in plant.

SOLUTION: Childers Aluminum Jacketing installed. Fireproof—easily cleaned of oil to reduce fire hazard.

Do Insulated Lines in Your Plant Cause These Three Common Problems and Hazards?

Read How Special Aluminum Jacketing Solved Them for Scott Paper Company



PROBLEM: Costly replacement of insulated lines damaged by oil drippage and bumping by men and tools.

SOLUTION: Maintenance engineers replaced canvas jacketing with Childers Aluminum Jacketing. Easy to wipe clean . . . durable and resistant to abrasion and abuse. Maintenance cost reduced.

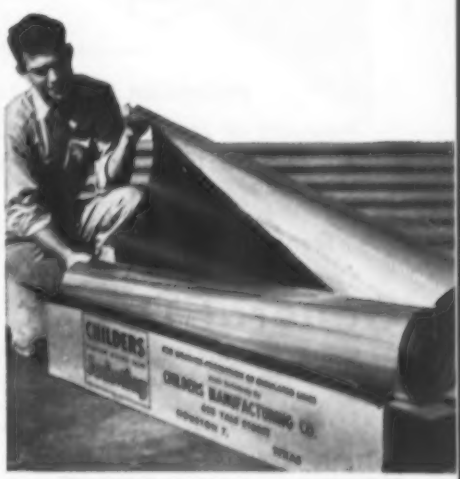
The Scott Paper Company, Chester, Pa., and nearly 1,000 other modern plants in this country have protected insulated lines with Childers Aluminum Jacketing.

Childers Aluminum Jacketing cuts maintenance costs. It needs no upkeep . . . retains its protective value for years. Because Childers Aluminum Jacketing needs no painting, it can actually pay for itself in this saving alone. And of course, this modern aluminum jacketing can be removed and replaced easily for line repairs.

Easy installation cuts cost even farther. Only tools needed are pliers and wedge. Economical strapping holds jacketing securely—allows easy removal.

Try this low-cost protection in your plant. Write today for engineering data and information about how you can order a 400 sq. ft. roll to test on one of your insulated lines. No obligation. For full details write to: Childers Manufacturing Company, Department IP-7, 3620 West 11th Street, Houston 8, Texas.

SPECIFICATIONS
Childers Light-Weight Aluminum Jacketing
Shipped in rolls. 4 ft. wide; 100 ft. long with or without moisture barrier. Aluminum of .006" thickness. Cut with straight edge and dull knife. Write now for full details and engineering data.



LOW COST Childers Aluminum Jacketing answers many problems in plants all over the country. It's light weight, easy to install—goes on with simple bands. Weather, water, heat and fire resistant—can be used and re-used for years.

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ideas in action

—Starts on page 62

Q. No. 1—Does Section 2411 prohibit the use of fuses in multiple on low voltage controllers feeding motor branch circuits?
A.—Yes
Q. No. 2—Does Section 2411 prohibit the use of fuses in multiple on high voltage controllers feeding motor branch circuits?
A.—Yes

Interpretation No. 413

Chapter 9; Parallel Cords, Construction of
Statement:—A three-conductor parallel cord is intended for use with air-conditioning equipment. The cord consists of two conductors having 5/64 in. of the thermoplastic insulation and one conductor with a covering of 1/64 in. of green thermoplastic. The two conductors having the heavier wall of insulation are intended as the current-carrying conductors to the air-conditioning equipment, while the third conductor with the thin green covering is intended as the grounding conductor. All conductors are of the same size, but the green covered conductor is placed between the two current-carrying conductors and is exposed only when the cord is separated at the terminals.
Q.—Does this construction comply with the intent of Sections 94003, 94004, 94005, and paragraph b of Section 2559?
A.—Yes

Interpretation No. 414

Section 2003; Autotransformers
Statement:—An emergency service in a hospital is obtained from a 3-phase ungrounded delta connected 240 v generator through a zig-zag wye connected autotransformer that changes the voltage to 120/208 and provides a grounded neutral. This grounded neutral is solidly connected to the neutral of the main service from the public utility supplying the hospital with light and power.
Q.—Does this use of the autotransformer comply with the intent of Section 2003?
A.—Yes

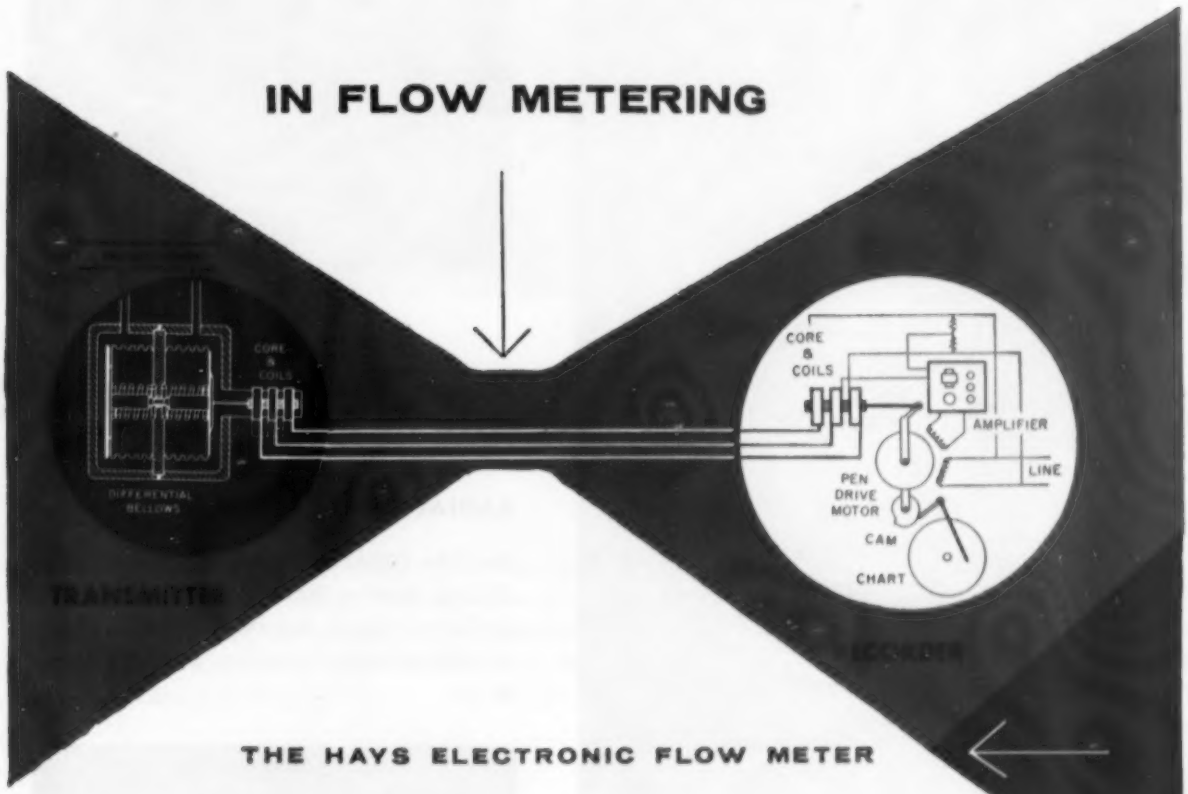
Sealing Compound Protects Electrical Equipment Against Moisture

At Coast Packing Co., Vernon, Calif., the daily "washdown" requires use of 180 F water at 250 psi pressure. Washdown operations exposed electrical solenoids, fuses, magnetic coils, conduits, switchgear, and other electrical equipment to damaging moisture, condensation, and extreme temperature changes. Motors, because of premature deterioration of electrical insulation, broke down on an average of twice a month.

In 1946 Larson-Hogue Electric Co., Los Angeles, rewound and processed one of the most exposed motors in the plant with a chemical compound known as Safe-T-Seal. This particular motor, which used to break down every 10 days to two weeks, was returned to the same spot after sealing. When it continued to function for a period of over a month without failure, other applications were made throughout the plant. Some of the original applications are still operative after six years. In addition, all the exposed solenoids, switchgear, fuses,

new dimensions

IN FLOW METERING



THE HAYS ELECTRONIC FLOW METER

hays CORPORATION

MICHIGAN CITY 2, INDIANA

Automatic Combustion Control • Ver-flow Meters and Ver-trol • Electronic Oxygen Recorders • CO_2 Recorders Boiler Panels • Gas Analyzers • Combustion Test Sets Draft Gages • Electronic Flowmeters • Miniature Remote Indicators • Electronic Feed Water Controls

Here is a new Flow Meter—that is really new! These features of the Hays Electronic Flow Meter speak for themselves.

Mercuryless—costly mercury maintenance headaches eliminated—no mercury to lose.

Rupture-proof Bellows—provide positive protection against over-range.

Continuous integration—motor-driven continuous mechanical integrator is extremely accurate even on rapid load changes.

Electronic operation—requires only 4 seconds for full scale pen travel with accuracy of ¼% of full scale differential.

Other features include null-balance transmission, powerful motor, easy readability, accuracy unaffected by normal temperature changes. Explosion proof transmitters and wide range meters also available.

For complete information, write for Bulletin 54-1074-222.

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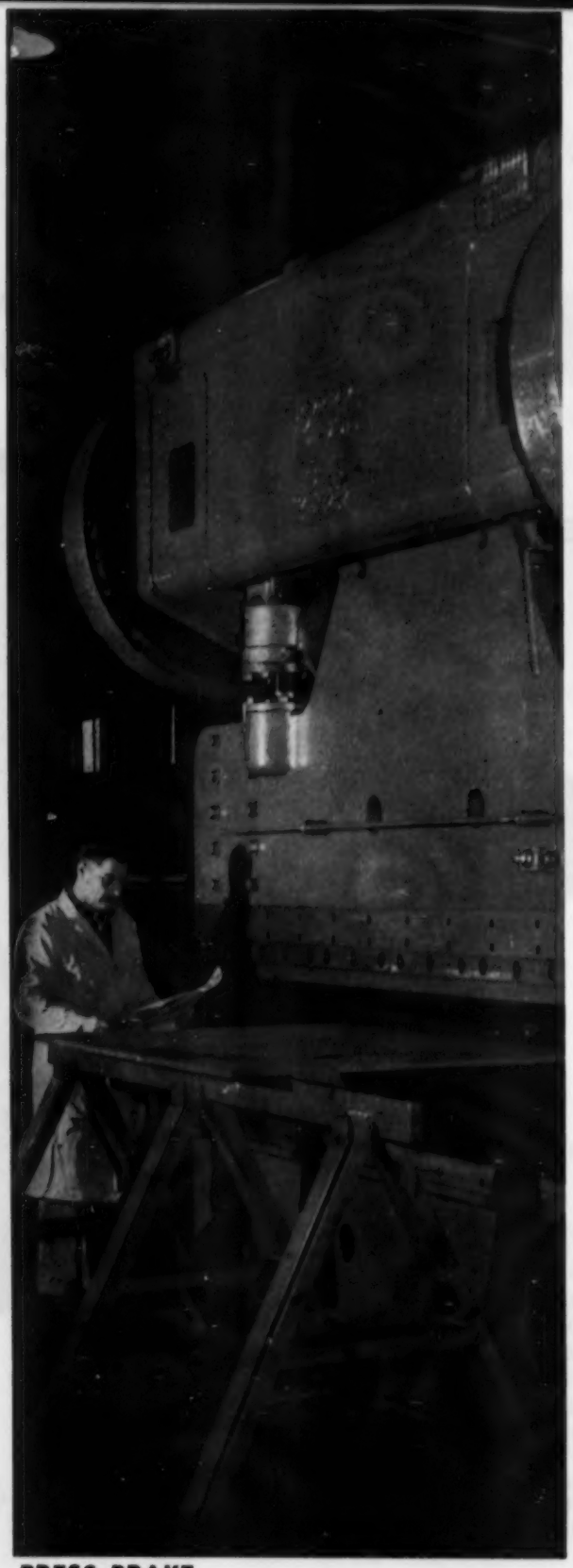
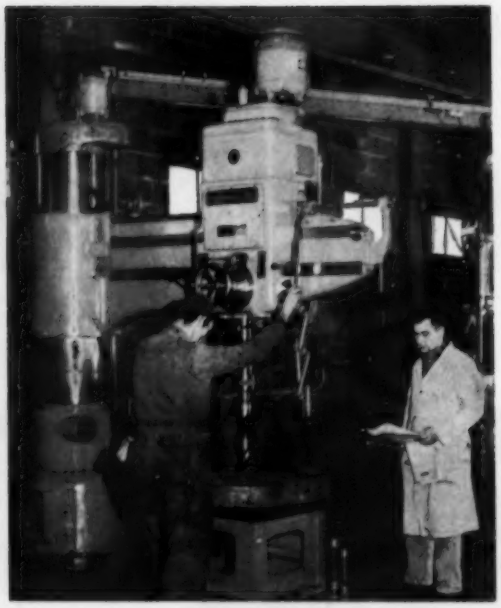


PRESS BRAKE

PRESS BRAKE, 400 Ton capacity, for forming and bending. Also equipped with demountable bed and ram flanges for gang punching or heavy progressive die work.



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RADIAL DRILLS, for heavy duty, high speed drilling, reaming, tapping, counter boring and similar operations. Automatic clamping of arm on column assures accuracy without expense of jigs.

Heavy Equipment Saves You Money

SQUARING SHEAR

SQUARING SHEAR, ¾"x10' capacity, for accurate blanks. Also equipped with adjustable ram for notching and slitting special shapes of unlimited lengths. Micromatic adjustment screws permit close-tolerance setting of blade to insure true 90° cut.

GEARED HEAD ENGINE LATHE

ENGINE LATHE, 30 inch swing by 25 feet between centers, with two compound tool-rest carriages. Motor-driven taper attachment on each carriage, which allows turning of continuous tapers along entire length of the machine.

designers and fabricators of precision steel weldments

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IT'S EASY TO MAKE

Repairs

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Just mix and fix—it's easy with Smooth-On No. 1 Iron Cement. You can seal cracks in pipes, boilers, metal containers . . . tighten loose screws and fixtures in wood, metal or tile . . . anchor bolts in concrete. Smooth-On expands as it sets and hardens like iron. Makes a tight, lasting repair that virtually becomes a part of what it fixes. Keep a can on hand (Smooth-On doesn't deteriorate) and use it as you need it—at a cost of only a few pennies per repair.

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New, completely revised, 48-page illustrated handbook has hundreds of time and money saving repair tips for jobs in the plant and around the home. Millions of these repair handbooks have been distributed during our 58-year history. Write for your copy today.

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SMOOTH-ON
THE IRON CEMENT OF MANY USES

Circle 531 on Reply Card for more data

ideas in action

—Starts on page 62

magnetic coils, and conduits have been sealed with the compound cutting down maintenance costs and eliminating costly work stoppages.

Safe-T-Seal operates on the principle of impregnation of the insulation itself, fortifying the insulation against premature deterioration due to moisture, condensation, humidity, extreme changes of temperature, or other such external factors. It has no dielectric strength and so can be applied directly to contact points. Safe-T-Seal is distributed by MB Aircraft, 3100 Vanowen St., Burbank, Calif.

Permanent Magnets Solve Tramp Iron Problem

In the millwork and lumber industries, tramp iron can be a fire hazard besides causing machinery damage and production contamination. At Rock Island Millwork Co. wood blocks and scrap are belt fed to a hammermill and pulverizer — the first steps in manufacture of the company's Resinwood board. Bits of metal mixed with the wood scrap might damage either or both of the machines and sparks generated by iron in the mills could start a serious fire.

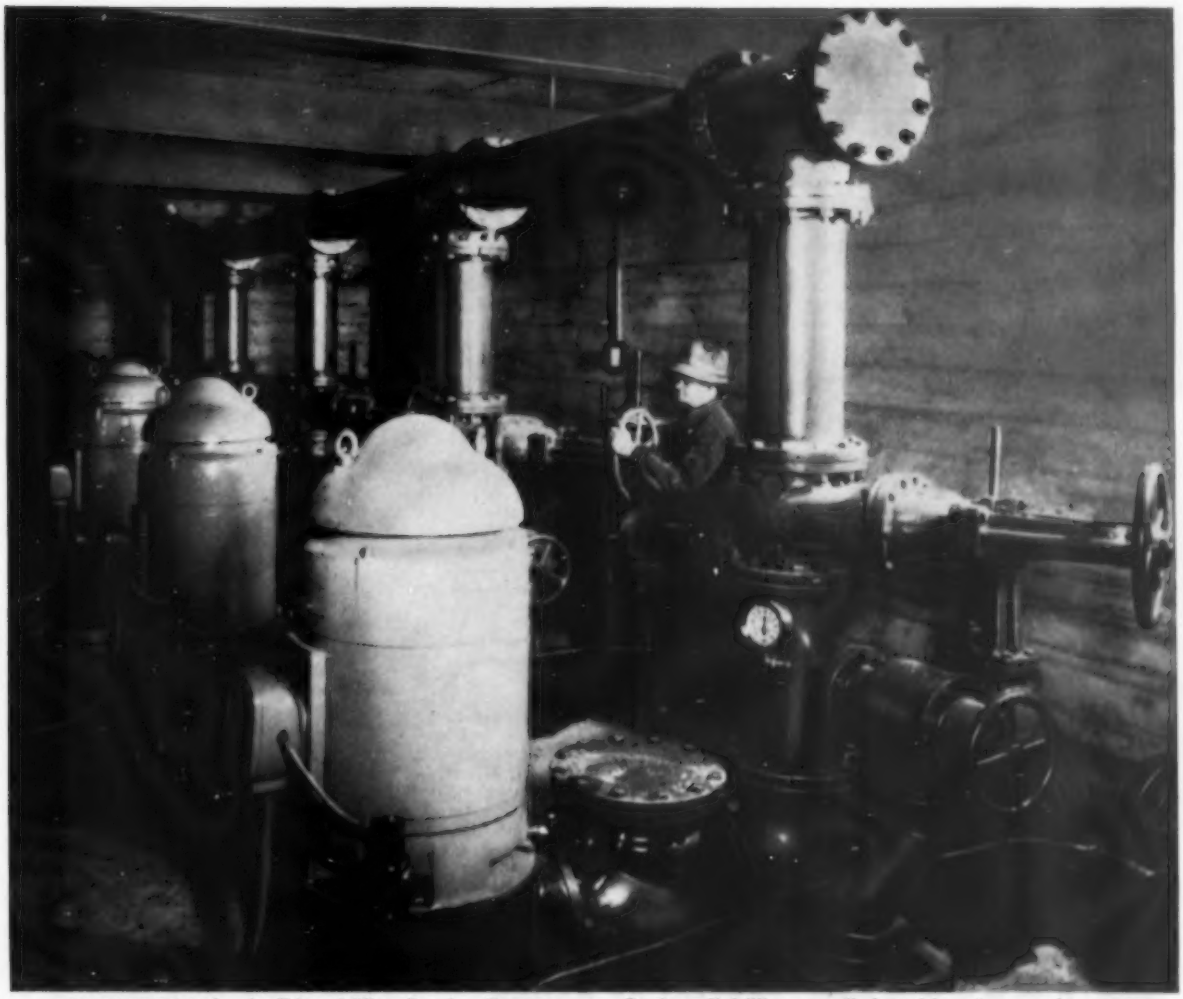
Eriez Manufacturing Co. engineers installed a 8 in. dia Eriez magnetic pulley as the head pulley on the belt conveyor carrying wood scrap. This pulley encloses

Stray pieces of metal are held by Alnico V magnet.

built-in magnetic elements of Alnico V metal which provide a constant and penetrating magnetic field across the entire face of the pulley. In operation, all wood material falls free on reaching the pulley, but any pieces of stray iron are securely held by the magnet's action until the return of the belt has carried them beyond the point of its contact with the pulley, where the metal falls automatically into a container. About 25 lb of tramp iron is removed from this container each week. To afford similar protection in other parts of the plant, Rock Island has also installed a number of Eriez plate magnets in sheet metal ducts handling sawdust or chips.

Since these magnets are entirely non-electric, installation involves no wires, fuses, or connections. Operation is continuous, regardless of power lags or failure.

(Continued on page 86)



FIRE PROTECTION for the Edward Hines Lumber Company is assured by four Worthington vertical turbine fire pumps. Costly well drilling was eliminated here because the versatile Worthington pumps take water from a nearby river.

We hope these Worthington pumps are never used!

Don't get us wrong. They're good pumps. Can't be beat for always-adequate pressure, long life and real dependability.

Thing is, though, they're fire pumps — Worthington vertical turbine fire pumps — ready to supply water for the sprinkler system at the Edward Hines Lumber Company in Westfir, Oregon.

Main point — if and when they're ever needed, these Worthington pumps will go to work instantaneously, delivering enough water to quench any fire. Reason is they're always primed. And on top of approval by Factory Mutual and Underwriters Laboratories, they're guaranteed by Worthington to deliver rated capacity — whether pumping from a deep well or from a surface supply.

Our bulletin W-450-B42 tells all about the Worthington vertical turbine fire pump. Write for it today — you may be glad you did. Worthington Corporation, Vertical Turbine Pump Division, Harrison, N.J.

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THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER — IT IS A VALUABLE RESOURCE

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names make news

. . . personalities from industry and power

Chapman Valve Mfg. Co. has re-elected **Emerson G. Gaylord** as chairman of the board, **Ernest Cochran** as president, **David M. McIntosh** as vice president in charge of production and also executive vice president. **Joseph A. Cerow** is re-appointed vice president in charge of engineering, **Frank A. Hunter** is appointed vice president in charge of sales, **A. Neilson Cochran** is assistant treasurer and assistant clerk.

Prat-Daniel Corp. announces appointment of **Richard F. Sharon** as manager of the Thermobloc Div.

Westinghouse Electric Corp.—Frank R. Benedict is appointed manufacturing engineer manager for the Sturtevant Div. He will supervise operating methods, tooling, and processes of manufacturing as well as coordinating functions of engineering.

The International Nickel Co., Inc.—Howard N. Farmer, Jr. joins the Development and Research Div. as a member of the West Coast technical field section at Los Angeles.

Link-Belt Co. has appointed **Russell J. Geitman** as chief engineer at the San Francisco plant. He will direct the design of all equipment made at the San Francisco plant.

Worthington Corp. — Aloysius M. Tullo, works manager of the Harrison Works, is named general manager of a newly established division to be known as the Harrison Division.

In the Standard Pumps Division, also newly established, **Vincent Gerbereux** will be general manager.

Minneapolis-Honeywell Regulator Co., Micro Switch Div., is setting up new sales and engineering offices in Phoenix, Charlotte, and Denver. **Ra'ph C. Froehlich** heads the Phoenix office, **Donald S. Schultz** will take charge of the Charlotte office, and **Richard J. Petersen** is in charge of sales and engineering in the Denver area.

Industrial Unit Heater Association— At its annual meeting the association elected **W. H. Rietz** as president, **T. R. Peyrek** and **I. W. Clark** as vice presidents. Rietz is executive vp of the Electric Ventilating Co., of Chicago. Peyrek is manager of the Heating and Ventilating Div., L. J. Wing Mfg. Co., of New Jersey. Clark is manager of the Heating and Ventilating Dept., American Air Filter Co., Inc., of Kentucky.

Edward Valves, Inc. appoints **B. J. Milleville** as chief engineer. He succeeds **David MacGregor,** who is now Edward works manager.

New York & New Jersey Lubricant Co.—Robert A. Henkel is appointed sales representative in the Pittsburgh and Western Pennsylvania territory.

Ric-wiL, Inc. has elected **Bradley Pruden** as vice president in charge of engineering. He was formerly associated with Giffels & Vallet, Inc. and L. Rosetti, Associated Engineers and Architects.

D. J. Murray Mfg. Co. appoints **W. A. Marquardt** as assistant manager.

Diamond Power Specialty Corp. appoints **Herman Krapf** as manager of its Chicago district office.

Hapman-Dutton Co.—In the Dutton Boilers Div., **T. W. Eshbach** is appointed boiler sales manager.

Stephens-Adamson Mfg. Co. announces election of **A. D. Sinden** as vice president and appointment of **D. W. Parkin** as chief engineer. **J. R. Streit,** Chicago branch office manager, is named regional sales manager; **H. S. McIntosh** is named assistant plant manager; and **E. O. Weise,** assistant chief engineer.

G H K-Associates, Engineers, Industrial Consultants, and Designers announces two new engineering associates: **Neree D. Alix** and **Edwin G. Siegel.**

Iron Fireman Mfg. Co. has elected **Wayne F. Strong** as president, a post which has been vacant for the past four years. Other officers are: **Frank S. Hecox,** vice president and treasurer; **W. J. O'Neil, C. T. Burg, E. C. Webb, Lewis J. Cox,** vice presidents; **C. C. Craft,** sec'y; **H. J. Mack,** controller.

American District Steam Co., Inc. has changed its name to ADSCO Industries, Inc. and has set up two new operating divisions. The North Tonawanda plant becomes the American District Steam Div. of ADSCO Industries, Inc. and the former California Steel Products Co. becomes the California Steel Products Div.

Babcock & Wilcox Co. announces appointment of **J. N. Rogers** as district salesman assigned to the St. Louis, Mo. office of the Tubular Products Div.

Atlas Valve Co. announces the election of **Harry T. Wentworth** to the position of general manager.

Federal Pacific Electric Co. appoints **Joseph C. Langaunet** product sales manager in charge of bus duct, trolley duct, and related equipment for the eastern switchgear division. **Harry Knudson** is appointed manager of the middle Atlantic sales region.

American Cyanamid Co. announces four appointments in the Market Research Dept. **Ivan Y. T. Feng, Robert M. Henderson,** and **James B. Smith** become senior market research analysts. **Dorothy Lesh** will serve as staff assistant for the department.

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CONTINUOUS BLOWDOWN
packet-type

complete, automatic control of boiler water concentration

Also Standardized or Special Units for ALL CAPACITIES.

PREVENTS PRIMING
PREVENTS FOAMING
PREVENTS SLUDGE
PREVENTS SCALE
(with simple chemical treatment)

This compact self-contained unit is completely assembled. Can be installed by your own men in hours. It provides completely automatic control of boiler water concentration regardless of variations in boiler load. This is accomplished WITHOUT HEAT LOSS. Maintain clean efficient boilers for substantial savings in fuel, equipment and manpower.

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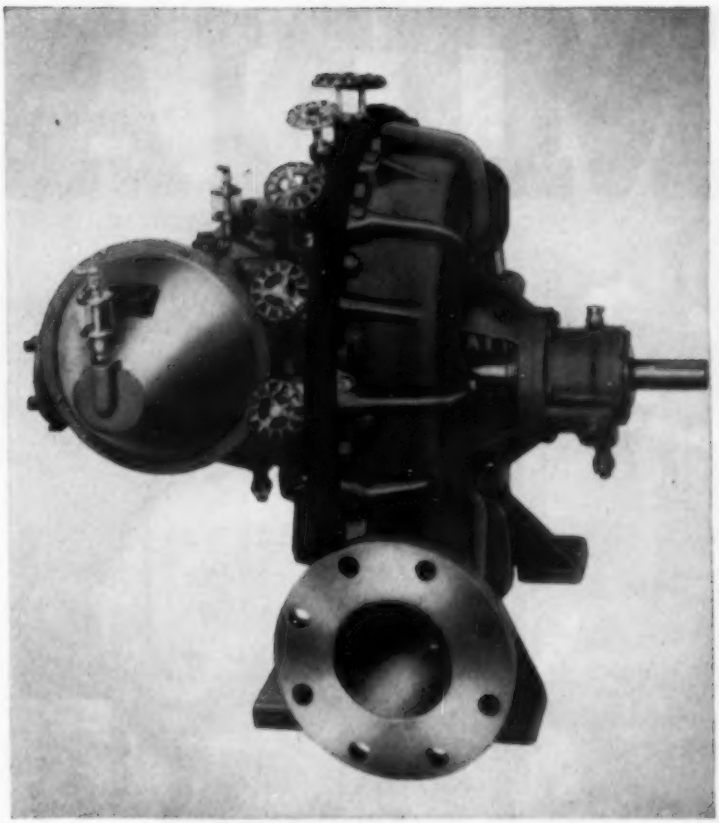

This is the reliable Coppus Turbine furnished with either type of wheel

Wide bucket "L" type wheel

Regular type wheel

Top performance in all COPPUS TURBINES

Both the regular type wheel or wide bucket "L" type wheel give you Coppus proven high quality and low maintenance cost. The "L" type wheel is the new development for use where low water rate is essential.

Coppus "Blue Ribbon Turbines" earned their fine reputation right on the job. Users vouch for their top quality performance and their low maintenance cost.

In the words of the supervisor of a large chemical company: "Coppus turbines require so little maintenance that a person would starve to death, if he depended on it for a living."

Proven features of *all* Coppus Turbines:

- Turbines rated close to your hp requirements, from 150 hp down to fractional. No need to buy a bigger, costlier turbine than your conditions call for.
- A larger number of steam nozzles, controlled individually by manually operated valves.
- Exclusive pilot operated excess speed safety trip supplementing constant speed governor.
- Replaceable cartridge type bearing housings.
- Optional carbon ring packing glands.

Coppus Steam Turbines ranging from 150 hp down to fractional, in 6 frame sizes, *make turbine dollars go farther*. Send for Bulletin 135 on Coppus Turbines.

COPPUS ENGINEERING CORPORATION
184 Park Avenue, Worcester 2, Mass.
Sales offices in THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

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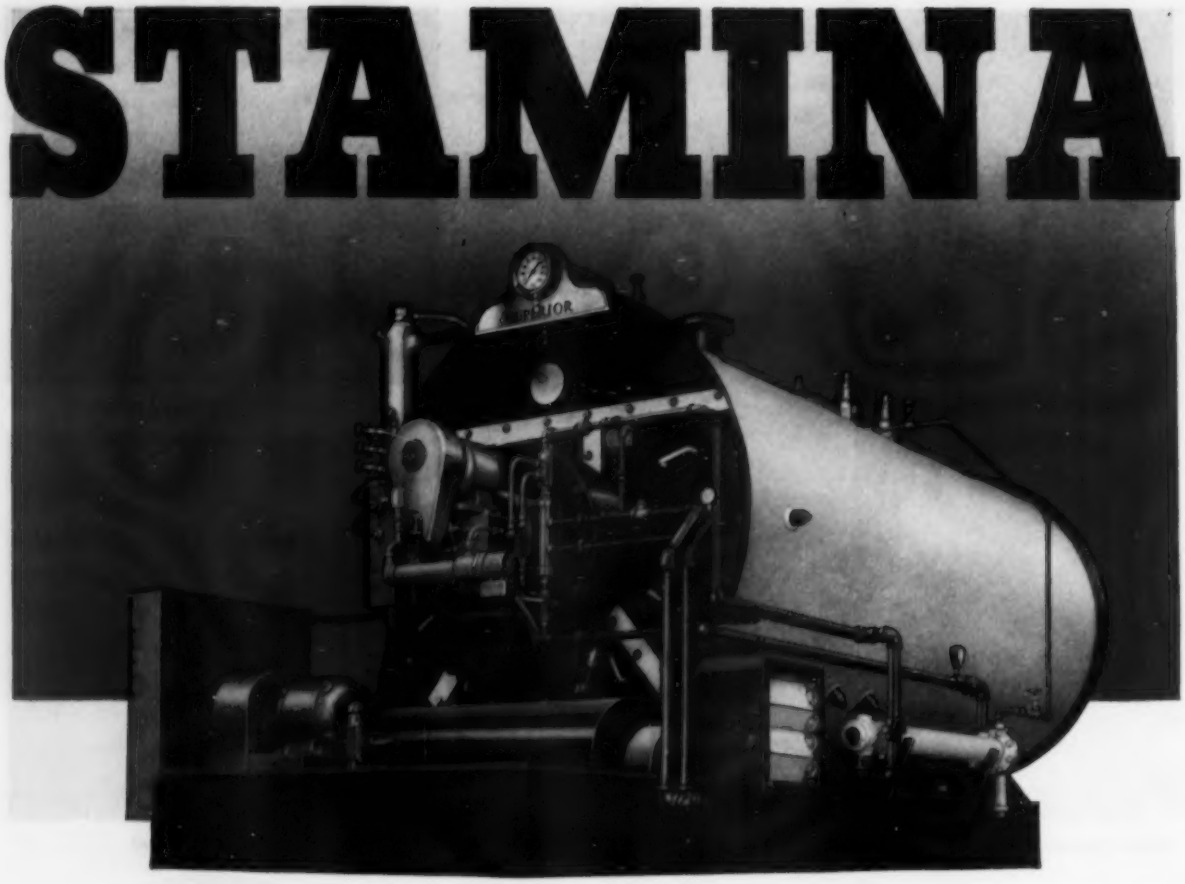
STAMINA



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Boilers, too, grow old ... and when the honeymoon of the first year or two is over, dirt, scale, and wear on moving parts start to take their toll in loss of efficiency. That's why Superior Steam Generators are built bigger, heavier, and more rugged, with four-pass construction and full 5 sq. feet of heating surface per boiler horsepower, measured on the smaller I.D. of the tubes. The relatively slow speed full bank induced draft fans, the larger triple-blow-down water column, and the rigid channel iron base are other typical features of design which add the stamina that makes efficient low cost steaming a reality ... not for a year or two; but throughout the long life of the unit.

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SUPERIOR
STEAM GENERATORS

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readers' guide

. . . an index to advertised products

The table below lists, according to product groupings, all equipment advertised in this ditional, detailed information. Circle this number on Reply Card, pages 34/35 & 74/75.

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bulletins

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AIR CLEANING & DUST COLLECTION

250—Industrial Dusts

"The Collection and Recovery of Industrial Dusts," 32-page manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains operation. Buell Engineering Co., Inc.

251—Pneumatic Systems

"Pneumatic Ash & Dust Handling Systems," seven-page catalog 652, outlines general principles of pneumatic materials handling and explains how this company's products meet requirements for each application. Allen-Sherman-Hoff Co.

252—Dust Collectors

Dust collectors, including cyclone, wet or dry dynamic, and cloth screen arrestor types are the subject of a 32-page bulletin. Uses of air conditioning, ventilating, conveying, drying, and cooling units are presented. Kirk & Blum Mfg. Co.

253—Dust Collectors and Arresters

Series of four folders describes cyclone type collector and portable, standard, and automatic bag-type dust arrestors. Also includes 32-page catalog describing exhaust fans for dust collecting and air handling. Northern Blower Co.

AIR CONDITIONING-HEATING & REFRIGERATION

254—Instantaneous Heaters

Answers to your hot water problems are given in booklet "Methods and Means." Operation and advantages of the instantaneous water heater as compared to the indirect method heater are discussed and illustrated. Pick Manufacturing Co.

Air Cleaning & Dust Collection 76
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255—Electric Heating

Industrial electric heating applications and methods are described in 32-page booklet, "101 Ways to Apply Electric Heat." Illustrated case histories show experience-tested ways to apply metal-sheathed Chromalox electric heating units in industrial jobs. Edwin L. Wiegand Co.

256—Heat Exchangers

Air-flow diagram in two-page data sheet 124 shows graphically operation of the Aero Heat Exchanger for water, oil, or compressed air cooling. How the unit saves cooling water, piping, pumping, and equipment costs is explained. Niagara Blower Co.

BOILERS & STEAM

257—Water-Tube Generator

Completely packaged Water Tube Type D Superior Steam Generators in 17 sizes, with capacities from 8000 to 40,000 lb of steam per hr, are described in detail in eight-page catalog 5M-54. Superior Combustion Industries, Inc.

258—Spreader Stokers

Spreader stokers said to be adaptable to all types and makes of modern steam boilers and generators, from 5000 to 75,000 lb per hr steam output capacity, are described in 14-page brochure 800. Various installations using Roto-Stoker Type CC stokers are shown. Detroit Stoker Co.

259—Condenser Tube Inserts

How to restore leaking condenser tubes to service by sealing off the deteriorated portion with inserts, is the subject of four-page leaflet 500. Tube cleaners, expanders, and maintenance tools are listed. Thomas C. Wilson, Inc.

260—Fintube Boilers

Fintube boilers and heat transfer products incorporating this company's 17 years of design experience in the chemical and petroleum industries are described in six-page folder 542. Brown Fintube Co.

261—Package Generator

Six-page foldout B-3100 describes in detail the Ticosteam package steam generator, a forced draft, fire tube, horizontal boiler fitted with burners of special design permitting use of any desired type of gas or fuel oil. Titusville Iron Works Co., Div. of Struthers Wells Corp.

262—Pressure Equipment

Catalog 400 covers this company's line of separators, traps, and boiler trim. It is a condensation of catalogs 500, 600, and 700. Wright-Austin Co.

263—Boiler Baffle Data

More than 30 boiler-setting plans are shown, with an analysis of how each arrangement of tubes is baffled to meet the specific boiler design, in 20-page bulletin BW-54. The Engineer Co.

264—Water-Tube Steam Generators

Packaged water-tube steam generators, Type MH, furnished for oil or gas firing or both, with automatic, semi-automatic, or manual combustion controls, are covered in detail in 16-page bulletin MH3-54. Union Iron Works.

265—Coal-Burning Installation

"Burning Bituminous Coal the Modern Way" contains 24 pages of case histories from industries of all sizes and types. Engineering survey results for equipment include annual fuel consumption and operating costs. Bituminous Coal Institute.

266—Tube Cleaners

Bulletin 43 introduces a new geared tube cleaner for removing scale in heat exchanger and condenser tubes of ⅜ to 2½ in. ID. The unit is said to be particularly effective where conditions require low speed and great power. Airetool Mfg. Co.

267—Package Steam Generators

Seven-page bulletin AXY-1 gives full operating details and describes changes that have been made in the Amesteam generator, which is factory assembled, for 15 through 200 psi pressures. Ames Iron Works, Inc.

268—Boilers and Stokers

Over 88 years experience are embodied in the design and construction of Scotch Marine type portable boilers says 28-page catalog. Photographs and cross-sections illustrate various models ranging in capacities from 6 hp up to 25 hp. The James Leffel & Co.

269—Firing Equipment

Over 50 years of leadership in the manufacture of industrial-commercial firing equipment is reflected in 19-page general catalog 3048. Schematic drawings and layouts of typical installations are included. Petro Division.

270—Oil & Gas Burners

Advantages of preassembled oil, gas, and combination oil and gas burners are listed in eight-page bulletin P-152. Units in sizes from 50 to 900 hp are listed for four common gas pressures and all grades of oil. Coen Co.

271—Package Boilers

Two-drum, bent tube package boilers for steam, and high pressure, high temperature hot water are discussed in a four-page folder. Ratings, data, and dimensions are given in table form. Springfield Boiler Co., Div. of John W. Hobbs Corp.

272—Package Boiler Controls

Specifications for the fully automatic, all electric metering type packaged controls for shop assembled boilers are given in four-page bulletin 54-1088-239. Schematic drawing shows a typical packaged control system. The Hays Corp.

273—Flue Dampers

Booklet 1-HEA on curtain type dampers for flue gas control explains what the damper is and does, construction, dimensions, installations, and gives case histories. Heacon, Inc.

274—Tube Expanders

Ideal tube expanders made for every condition are described in eight-page fold-

NOTE—Each bulletin has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 74/75.

How to Reduce **Production Headaches** *Caused by* **V.V.T.***

***Varying Voltage Troubles** can occur in your plant every time the voltage varies to electrically-operated equipment — *and that can be happening many times a day!*

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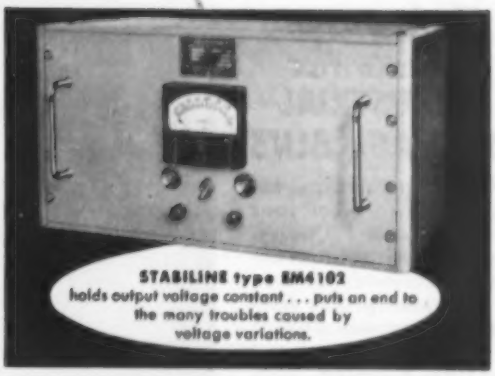

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bulletins

—Starts on page 76

out 402. Specific uses for each type are given along with cross-sections showing the units in use. The Gustav Wiedeke Co.

275—Atomizing Oil Burners

The cheapest grades of oil or tar can be completely atomized and efficiently burned with Type SA steam atomizing oil burners according to 16-page bulletin 21. Models for various special uses are described. National Airoil Burner Co., Inc.

276—Check Your Steam Costs

"Have You Checked Your Steam Costs Lately?" This 15-page handbook is a non-technical presentation of vital interest to everyone considering merits of replacing existing boiler equipment or purchasing new equipment. Orr & Sembower, Inc.

277—Process Gages and Valves

Condensed catalog 236, eight pages, covers a complete line of process gages and valves for observation of liquids and levels. Standard and optional construction features and dimensional data are furnished. Jerguson Gage & Valve Co.

278—Gages and Columns

How the Bi-Color water gage operates to show actual water level without transmission by mechanical, electrical, or hydrostatic means is explained in 23-page bulletin 1051. The many types of gages and their installation are pictured. Diamond Power Specialty Corp.

279—Liquid Level Equipment

Liquid level gages, water columns and allied equipment for industrial, chemical, and power plant service are covered in bulletin 11-1-51. Specification and application data are included. Ernst Water Column & Gage Co.

338—Steam Cost Calculator

Made of heavy board, this Steam Cost Calculator will enable you to read directly cost of steam per hp for installations using oil, coal, or gas. It also gives a direct reading of efficiency of the system. Hapman Dutton Co.

339—Combustion Sampling

The full story of a newly developed sampling system for continuous trouble-free sampling and oxygen measurement of combustion processes is told in bulletin 703. The equipment described is designed for steam generating plants, rotary kilns and driers, open hearth furnaces, and tanks. Arnold O. Beckman Co., Inc.

340—Heating Controls

Automatic heating controls equipped with sealed mercury contact switches for warm air furnaces, hot water heating systems, and steam heating, are described in four-page folder 28i/Me. Units include thermostats, transformer-relays, primary controls, and limit and operating controls of various sizes and ranges. The Mercoid Corp.

341—Vertical Unit Boiler

More than 25 years of development, manufacturing, and application experience are reflected in the design of the Type VU-10 vertical-unit boiler described in 16-page bulletin VU 10-8. Advantages and design features are discussed. Combustion Engineering, Inc.

BUILDING MATERIALS & MAINTENANCE

280—Flooring

"Handbook of Building Maintenance" gives valuable information on keeping your plant in efficient working order. Instant-Use concrete floor patch is described along with other materials for repairing floors. Flexrock Co.

281—Repair Cements

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. Smooth-On Mfg. Co.

282—Steel Shelving

Photographs, cartoons, and text are used to point out the features of the new Hallowell Adjustable Steel Shelving in four-page folder 2057. The open and closed type, the ledge type, and various combinations of swinging and sliding doors are featured. Standard Pressed Steel Co.

COMPRESSORS & BLOWERS

342—Air Compressors

Descriptions, design features, and specifications for industrial air compressors are contained in 16-page brochure 5110-A. Models are for belt or direct motor drive from ½ to 100 hp. Accessories and controls also are described. Schramm, Inc.

343—Compressors

Horizontal heavy duty air and gas compressors, Type T, are described in 15-page bulletin 728-8. Cross sections of crankshaft, inlet valve unloading system, compressor cylinder and valves, and the complete compressor add to the value of the booklet. Chicago Pneumatic Tool Co.

ELECTRICAL DISTRIBUTION

283—Air Circuit Breakers

Bulletin 5107-DR-1 contains four pages of facts, figures, features, and photographs on types KA, KB, KC, and LG Urelite air circuit breakers, and on weatherproof and dust-tight enclosures. I-T-E Circuit Breaker Co.

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284—Distribution Transformers

"Allis-Chalmers Protected Distribution Transformers," eight-page bulletin 61B-7309B, gives operating advantages of the transformers available in ratings of 3 through 100 kva, 2400 to 14,400 v, and mechanical data on five type designations. Allis-Chalmers Mfg. Co.

285—Transformers

Types 136 and 236 Powerstat Variable Transformers — design, new ratings, and performance—are discussed in eight-page bulletin P384. The Superior Electric Co.

286—Fuses

Hi-Cap fuses for the protection of loads above 600 amp are described in six-page bulletin HCS. Two handy charts are included: Current Limiting Effect and Opening Time Curves. Use of these fuses in conjunction with Fusetron fuses is explained. Bussmann Manufacturing Co.

287—Dry-Type Transformers

"Latest Developments in Dry-Type Transformers," seven-page catalog 153-A, presents the advantages of air-cooled units designed and constructed primarily for inside installations. Sorgel Electric Co.

BULK MATERIALS STORAGE?

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Any shape or size engineered to meet your requirements . . . heavy, monolithic construction . . . smooth-surfaced . . . weatherproof, fireproof, corrosion-proof . . . contents protected against freezing, condensation, spoilage, contamination . . . appearance that ties in with modern industrial buildings . . . . . . long-lived.

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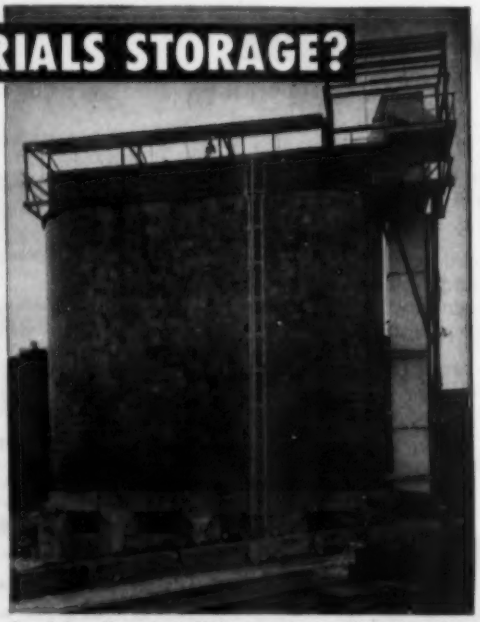

Sand handling installation at large Ohio foundry. *Kalamazoo* design and construction provides more useable space than ordinary multiple bins.

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Sure . . . you can cut firing costs by burning heavy fuel oil . . .

but you've got to control the oil feed

and Petro does this superlatively well without complicated gadgets

The so-called viscosity problem with heavy oils is overrated. This is so because the viscosity of *all* fuel oils approaches a common point as the temperature is raised, and the temperature at which viscosity becomes a negligible factor is well within a practical operating range.

The Petro thermal viscosity control system is simply this: an electric valve controlled by the oil temperature refuses to admit oil to the atomizing cup until the oil has reached a desirable burning temperature. This temperature is arrived at by circulating the oil through heaters when necessary. This accomplishes four important results:

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A reservoir of warm oil is maintained. In the use of this thermal viscosity system, all of the heated oil which is not required for immediate firing is returned to the storage tank. Thus a constant pool of warm oil is ready for any changes in firing needs. The amount of oil being returned is easily regulated by the owner of the burner, to suit his individual needs.

No manual attention is required

The entire operation is automatic. There are no involved mechanical controls requiring adjustment or maintenance.

Saves labor costs—saves fuel costs

Why don't you find out how much Petro industrial oil burners can save for you? They are quickly adaptable to nearly every existing boiler. Send in the coupon below for full information.

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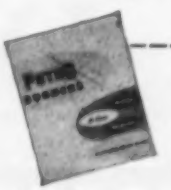
OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT



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bulletins

—Starts on page 76

288—Power Factor Correction

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. Sprague Electric Co.

289—Outdoor Service Equipment

Designed to make easier the selection of outdoor service equipment, 12-page bulletin 2016 combines descriptive data on all available standard equipment—service entrance, receptacle type, dual control, three-phase units. Heinemann Electric Co.

ELECTRIC UTILIZATION

344—Variable Speed Motors

How variable speed motors are used to improve production is described in 16-page brochure 1797. In addition to describing advantages the booklet describes design theory and construction features. U. S. Electrical Motors, Inc.

345—Motor Control Center

Saving in space and expense and improved performance is explained in 12-page bulletin 170. Electrical and constructional details of these groups of combination motor starters and their components are fully described. Arrow-Hart & Hegeman Electric Co.

HEAT EXCHANGERS & WATER HEATERS

346—Heat Exchange Equipment

This 16-page bulletin gives all pertinent specification data for hot water storage heaters, instantaneous and convertor heat exchangers, instantaneous and convertor water heaters, and fuel oil heaters. Patterson-Kelley Co., Inc.

INSTRUMENTS & CONTROLS

290—Controls

The Gotham line of indicating, recording, and controlling instruments is summarized in four-page bulletin GL-1. Included are photos and descriptions. United States Gauge Div., American Machine and Metals, Inc.

291—Control Valves

Three basic types of single seated diaphragm control valves are discussed in 15-page bulletin 5304. Cut-away views and charts with complete specification data make this a good reference book. Leslie Co.

292—Temperature Regulators

Temperature control by means of temperature regulators that combine both a pressure and thermal element is discussed in four-page folder 1008. Spence Engineering Co., Inc.

293—Temperature and Pressure Control

Through years of experience in instrument design and manufacture, this company has developed a specialized line of equipment for the recording and indicating of temperature and pressure. Seven-page bulletin G-156-A shows typical examples of such equipment. The Electric Auto-Lite Co., Instrument and Gauge Div.

294—Flow Meters

With an alarm control, the flow meters described in this bulletin have only three moving parts. How they operate to ring a bell, light a light, or activate a motorized valve is explained by means of illustrations. Henszey Co.

LUBRICATION

295—Chemical Feeders

Install Series 30-T chemical feeder on your boiler feed-water pumps and you can forget troubles due to guesswork, inaccuracy, or forgetfulness according to four-page folder 5M. Flow diagrams explain operation and advantages. Manzel Div. of Frontier Industries.

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347—Diesel Lubrication

Written for everyone interested in the lubrication of diesels, "Lubrication of Diesel Engines," has been revised as technical bulletin B-1, 48-pages. It discusses diesel principles and design, types of engines in use, operating cycles, accessories and choice of lubricants. Sun Oil Co.

296—Oil Filters

Eight-page bulletin F-132 describes in detail construction and operation of hydraulic systems with special emphasis on contamination of hydraulic fluids from various causes, and demonstrates the correct filtration system. The Hilliard Corp.

297—Bearing Lubrication

"Industrial Bearing Lubrication" is a reprint from the magazine **Lubrication**, October, 1954 issue. The article covers bearing design, surface, overhaul, and aspects of lubrication. The Texas Co.

298—Motor Lubrication

"Lubrication of Electric Motors: Ball and Roller Bearing Type," four-page bulletin 504, fully describes proper methods for lubricating and cleaning ball and roller bearings on electric motors. New York & New Jersey Lubricant Co.

POWER TRANSMISSION—MECHANICAL

348—Centrifugal Clutch Coupling

Eight-page bulletin CE-3 explains the 11 new important features of the Twiflex flexible automatic centrifugal clutch coupling. This is not just a catalog, but a collection of valuable engineering data on this type of coupling. The Hilliard Corp.

349—Belt Conveyor Design

Engineering data required to design a belt conveyor for any application are presented in 86-page catalog 852. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. The Jeffrey Mfg. Co.

350—Adjustable Speed Equipment

Principle of operation and use of Dynamatic Eddy-Current adjustable speed equipment is described in 16-page bulletin GB-2. Typical torque and load curves are given. Dynamic Div., Eaton Mfg. Corp.

351—Chains and Sprockets

Catalog 950, 340-pages, with its flexible cover and thumb index will prove to be invaluable to the engineer interested in

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You can depend on WIEDEKE quality
PACKAGE
BOILER
. . . and Stationary Fire Tube Boiler Tubes can be rolled and flared in one operation with this Modern Parallel Rolling Tube Expander.
See your Dealer or Write us for Bulletin 3400.
Guard holds Flare Roll back—desirable for rolling Tubes closely spaced in thin Tube Sheets.
THE GUSTAV WIEDEKE COMPANY
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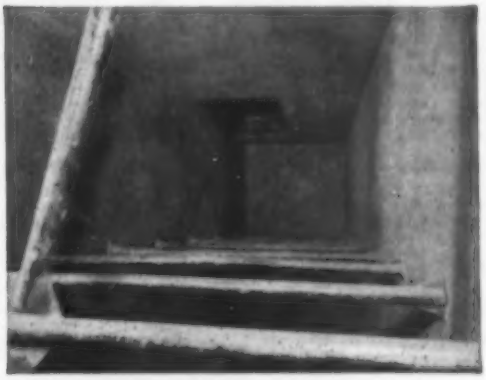
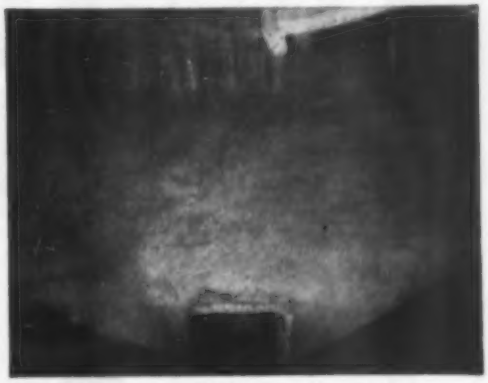
5½" of TOUGH REFRACTORY CONCRETE will top this boiler floor. Cement gun application of a castable refractory mix speeds installation . . . cuts downtime.

DURABLE INDUSTRIAL CONCRETE LINING of this giant multiclone ash precipitator is made with Lumnite calcium-aluminate cement and selected aggregates.



MANY PROBLEMS OF HEAT, corrosion and abrasion are easily solved with Lumnite cement linings. This hot-air duct features a smooth, jointless lining made with a castable.



HEAT-RESISTANT CONCRETE MADE WITH LUMNITE resists heat, abrasion and thermal shock in this ash hopper. Easy-to-place Heat-Resistant Concrete is ready for use within 24 hours.

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bulletins

—Starts on page 78

chains and sprockets for conveying, elevating, and power transmission. Tables of pre-engineered drives facilitate selection. Link-Belt Co.

352—Poly-V Drive

Design characteristics of the Poly-V drive, a single, endless belt with molded length-wise ribs, are explained in eight-page folder 6636. Line drawings and text compare the Poly-V with conventional drives and point out advantages. Manhattan-Rubber Div., Raybestos-Manhattan.

MATERIALS HANDLING & STORAGE

299—Tile Storage Bins

"Vitrified Glazed Tile Industrial Storage Bins," four-page bulletin 1153-B, tells you how this type of bin can keep materials clean, dry, and ready for use. Drawings show how the tiles are constructed and the simplicity of erecting silos made of these tiles. Kalamazoo Tank and Silo Co.

300—Spiral Conveyors

"Spiral Conveyors," 44-page catalog 851, describes a complete line of spiral conveyors and fittings for meeting practically any requirement or operating condition. Tables list various classes of materials that can be effectively handled. Jeffrey Mfg. Co.

353—Storage Bins

If you specify vertical storage construction for handling flowable bulk materials, this ten-page foldout will help you visualize how this company's Super-Concrete Stave Storage Bins might meet your requirements. The Neff & Fry Co.

METALS & WELDING

354—Nickel Alloys

Helpful technical publications covering the many aspects of nickel alloys, and their applications, are listed in two bulletins. Instructions on how to order literature, free of charge, are included. The International Nickel Co., Inc.

PIPING, VALVES, & SPECIALTIES

301—High and Low Pressure Valves

Catalog 10 describes List 900 and 900 valves. The 900 is for a pressure range of 200 lb at 100 F to 300 lb at 1000 F. The 900 is for higher pressures. Chapman Valve Manufacturing Co.

Torque Wrenches

Both inch-pound and foot-pound torquers are described in this complete 68-page catalog. Types included are for a wide range of drive sizes with plain or ratchet head. **Please send requests directly to Proto Tool Co., Dept. IP, 22762 Santa Fe Ave., Los Angeles 54, Calif., with 10c.**

302—Steam Traps and Specialties

Catalog 68G, 31 pages, describes and illustrates steam traps, strainers, regulating and reducing valves, separators, and vacuum and lifting traps. Strong, Carlisle & Hammond Company.

303—Strainers

You can prevent rust, scale, and dirt from clogging steam equipment with use of Yarway fine-screen strainers, according to six-page bulletin S-304. Tables give prices, rates, dimensions, and woven screen data. Yarnall-Waring Co.

304—Solenoid Valves

If you use direct operated solenoid valves for automatic or remote flow control of liquids and steam up to 400 F, or of high viscosity liquids you will want to read 11-page bulletin V-2. Normally closed, normally open, explosion-proof normally closed, and three way valves are shown. The Johnson Corp.

305—Ball Float Traps

Ball float traps for draining water from air, gas, or steam lines or for draining light liquids from gas under pressure are described in eight-page bulletin 289. An orifice capacity chart and tables of maximum operating pressures help in selection. Armstrong Machine Works.

306—Valves

Needle, globe, plug, check, relief, and special valves are described in 44-page catalog 352A. Units listed are made of various metals, and are suitable for instrumentation, processing industries, hydraulic systems. Republic Manufacturing Co.

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307—Aluminum Jacketing

One of the most frequent problems in the use of aluminum jacketing on insulated lines is how ells, tees, and bends should be weatherproofed. Data Sheet E-130 presents three practical methods. Childers Manufacturing Co.

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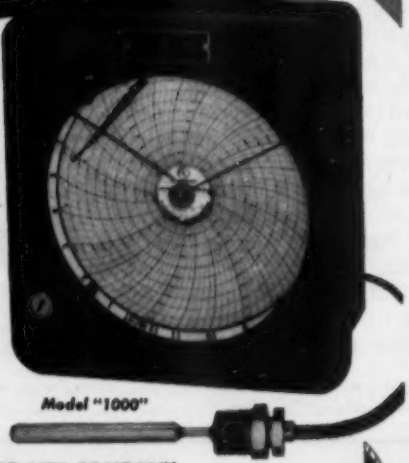

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FIG. 29 Cylinder with Impeller

FIG. 17-28 Cylinder

FIG. 215 Flanged

FIG. E-57 Double Window

FIG. 213 Visibility Welding Neck or Screw

FIG. E-811 Flapper

FIG. E-1810 Rotating Wheel Type

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308—Valves and Regulators

Specifications and operational data for steam, gas, air, oil, and water regulating equipment are presented in 60-page catalog 54. Illustrations and descriptions are included for pressure, temperature, and combination regulators, diaphragm, float, motor, solenoid, pop, and relief valves. O. C. Keckley Co.

309—Steam Jacketed Valves

"Viscous Materials," four-page folder E-300, will be of special interest to engineers of plants in which viscous materials are handled. Illustrations of steam-jacketed valves include a large cross section and an exploded view. Everlasting Valve Co.

310—Relays and Pilot Valves

Two-page leaflet 359 describes pneumatic relays and pilot valves, pressure-electric switches, and electric pneumatic valves. Included are gradual direct acting relays, gradual reverse acting relays, and gradual retarded, advanced, and minimum pressure relays. The Powers Regulator Co.

311—Steel Unions

Advantages of a patented, inexpensive steel union of new design, with one inserted bronze seat and polygonal pipe ends, made of rugged pipe coupling stock, are pointed out in bulletin P-100. Dart Union Co.

355—Rubber-Lined Pipe Joint

Nine-page handbook presents basic principle, design features, method of installation, plus parts and tools needed to utilize the Gaco rubber-lined pipe system. It compares cost of Gaco and flanged pipe installations. Gates Engineering Co.

356—Pipeline Expansion

Catalog 135, 24 pages, is packed with engineering applications and selection data necessary to the proper solution of pipeline expansion problems. The center spread is devoted to a schematic piping layout illustrating expansion joint application and principles. Flexonics Corp.

357—Float Traps

If you are planning to install low, medium, or high pressure float or float and thermostatic traps, you will need this illustrated catalog sheet. According to the data sheet, once these valves are installed, there is no necessity for the breaking of any pipe connection for servicing. Hoffman Specialty Manufacturing Corp.

358—Welded Floats

Units made of stainless steel, Monel, and chrome plated steel, in spherical, eliptical, and cylindrical shapes are shown in eight-page bulletin 785. Sizes from 2 to 14 in. dia for pressures from vacuum to 4800 psi are listed with weights, buoyancies, and collapsing pressures. W. H. Nicholson & Co.

PUMPS

312—Packings

Daroova Pumcups, which permit equipment to be operated at reduced speeds, are described in two bulletins: No. 4502 on Pumcups for air or hydraulic mechanisms; and 4401 on units for reciprocating pumps. Darling Valve & Mfg. Co.

313—Opposed Impeller Pump

How opposed impellers balance axial thrust is covered in 12-page brochure 1502. Sizes from 2 to 4 in., with 2 to 8 stages, are presented for capacities to 1000 gpm, pressures to 1200 psig, and temperatures to 350 F. DeLaval Steam Turbine Co.

314—Centrifugal Pumps

Eight-page bulletin 105-B describes Aurora Type O horizontal split case, double suction centrifugal pumps which are recommended for municipal and industrial water supply or for handling circulating

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bulletins

—Starts on page 76

and wash water. Aurora Pump Div., New York Air Brake Co.

315—General Purpose Pumps

How to determine total head against which pump must operate is only one of the valuable sections in 12-page bulletin 353-1000 on the Bilton pump, a general purpose pump suitable for medium and low head service. Byron Jackson Co.

316—Suction Pumps

Centrifugal Pumps — Four-page bulletin 512-A gives complete information on the Type SB horizontally split case, double balanced suction pumps including dimensional drawings. Weinman Pump Mfg. Co.

317—Sump Pumps

Automatic sump pumps, standard series, explosion-proof, totally enclosed, and submersible type are described in four-page folder 5382. Penberthy Injector Co., Div. of Buffalo-Eclipse Corp.

318—Sewage and Sump Pumps

Comprehensive, eight-page bulletin 335-A32 is for engineers, architects, and contractors who specify sewage and sump pumps. It describes in detail three types of pumps: The NKS Vertical Wet Pit Single or Duplex; the NKV Vertical Dry Pit; and the NKH Horizontal. American Marsh Pumps, Inc.

319—Bronze Rotary Pumps

Bulletin W-484-B2B, four pages, provides information on the diversified applications for bronze rotary pumps with herringbone gears. Performance chart provides information on speed, capacity, pressure, and power requirements. Worthington Corp.

320—Bronze Pumps

Rotary gear, rubber impeller, and centrifugal bronze pumps are described and examples given of typical applications in this catalog. Engineering data section lists operating characteristics and shows pump design. Oberdorfer Foundries, Inc.

REFRACTORIES & INSULATION

321—Castable Refractory

Bulletin 35 describes the service whereby this company provides engineering materials and erection service for vessel lining or heat enclosure jobs. Bigelow-Liptak Corp.

322—Refractory Concrete

"Refractory Concrete Manual," 16 pages, covers basic information on recommended practice for mixing and placing refractory concrete. Lumnite Div., Universal Atlas Cement Co.

323—Boiler Refractories

"Boiler Refractories," 20-page bulletin R-36, has been designed to provide operators of stationary and marine boilers with an authoritative guide for selecting the most efficient and economical refractories for their boilers. Babcock & Wilcox Co., Refractories Div.

TURBINES & STEAM ENGINES

324—Low-Cost Power

If you use steam for heating, cooking, or processing, you can get power at almost no cost with the use of a Wing steam turbine, according to bulletin SW-1a. Units give an almost infinite range of speeds, easy control by throttling. L. J. Wing Mfg. Co.

325—Multi-Stage Turbines

Smaller framed, multi-stage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, diaphragms, and many other design features are discussed. Terry Steam Turbine Co.

326—Steam Turbine Selection

Full details of this company's steam turbine are given in bulletin 135. How to save operating and maintenance costs by buying the right size for individual needs is explained. Coppus Engineering Corp.

327—Snubbers

Explosion resistant snubbers, known as the BEC, BES, and BEO lines, for commercial, standard, and optimum silencing respectively, are described in eight-page bulletin 252. Each type is shown in an elevation drawing accompanied by photos of typical installations in industry. Burgess-Manning Co.

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WASTE DISPOSAL

328—Waste Treatment

How this company has solved waste treatment problems for such industries as electro-plating, refinery, gas, and metal finishing is treated in detail in six-page booklet 70-B. Infilco, Inc.

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WATER TREATMENT

329—Filming Amine Protection

"Film Forming Corrosion Inhibitors Also Aid Heat Transfer," four-page technical paper No. 129, contains references to protection afforded by filming amines and attendant reduction in maintenance costs secured through protection against corrosion. W. H. & L. D. Betz.

330—Water Purification

"Boiler Feedwater Treatment," 19-page bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion-exchange. Hungerford & Terry, Inc.

331—Ion Exchangers

Strongly basic anion exchanger is presented in bulletin 57 which includes complete data on physical characteristics, exchange capacity and regeneration technique. National Aluminate Corp.

332—Filters and Strainers

Quick coupling, non short-circuiting fluid filters and strainers for water, chemicals, and oils can solve many maintenance problems for you according to four-page folder 654-MC. Ronningen Mfg. Co.

333—Boiler Water Foam

Laboratory pictures in this four-page folder show how Concentrol controls boiler water foam. Examples of its use in various industries are given along with an explanation of foaming. Bird-Archer Co.

334—Water Treatment

"Water Conditioning — One Source for Every Need," 19-page bulletin 611B, presents the wide range of products available from this company and explains how each type solves particular problems. Elgin Refinite Div., Elgin Softener Corp.

335—Demineralizing Handbook

"Handbook on Demineralizing," 40-page bulletin 5800-B, compares various methods of water treatment including demineralizers and evaporators. It goes into characteristics of various types of available cation and anion exchange materials and operating costs. Cochrane Corp.

336—Water Treatment

"No. 40 Series Supplementary Treatments," three-page booklet 28X8226, discusses supplementary treatments for boiler makeup water such as treatments for softening traces of hardness, dispersives for conditioning of sludge, oxygen scavengers, and anti-foam agents. Allis-Chalmers Manufacturing Co.

337—Water and Steam Cycles

"Industrial Water treatment and Engineering Service" tells of the five basic lines of defense to guard against difficulties in water and steam cycles. A two-page diagram shows a water and steam cycle power plant layout. Dearborn Chemical Co.

359—Deaerators

Spray-atomizing type units are shown in cross-section in four-page booklet 400. Function, design and operation, construction, outstanding features, and uses are discussed. American Water Softener Co.

360—Demineralization

"Demineralization including Silica Removal by Ion Exchange," 28-page booklet 3803, describes applications, principles of operation, and gives recommendations for demineralizing and silica removal apparatus and synthetic resins. The Permutit Co.

361—Package Feeder

Proportioning pumps and package chemical feeding units are described in this four-page folder. With liquid ends available for about 85 percent of all chemical pumping requirements, the pump is designed for use where a controlled capacity of fluid is necessary. How the feeding unit can be connected to the piping of your plant and to the electrical control equipment is explained. Bird-Archer Co.

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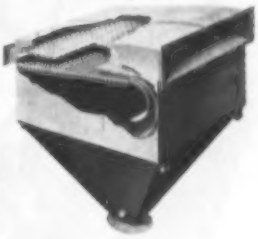

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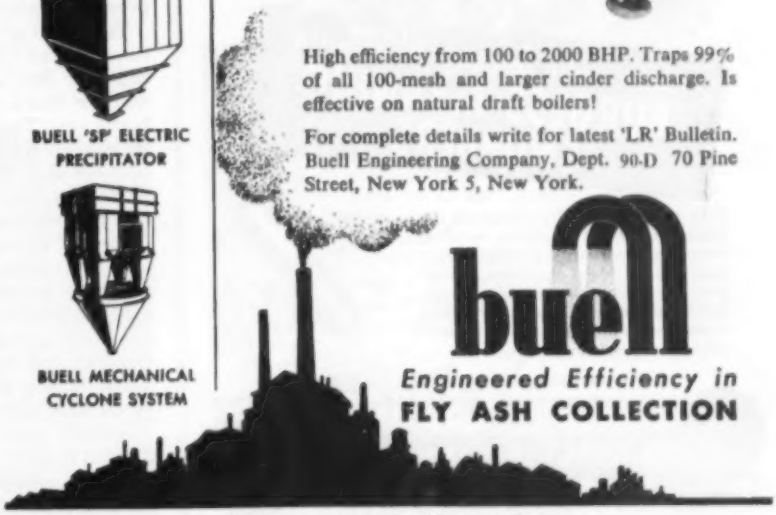

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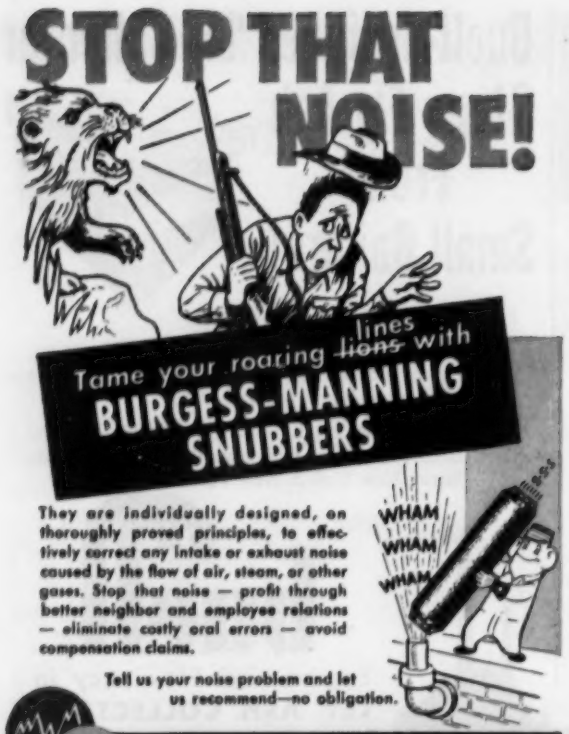
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ideas in action

—Starts on page 78

Central Vacuum System Reduces Fire Hazard

A safer plant, better working conditions, and lower insurance rates have been realized by the Wilmington, Del. plant of Bond Crown and Cork Co. from a central vacuum system that cleans up cork dust from the cork processing area.

This plant of Bond Crown and Cork, a division of Continental Can Co., produces about 100,000 gross of bottle caps per day. Approximately 50 tons of cork are used daily to make the cork discs that line the inside of the bottle cap. The cork, which is received in chunk form, is chopped, ground, and screened to produce particles of uniform size. These are mixed with adhesive and extruded into rods which are then sliced into the flat discs that go into the caps.

Each of the various processing machines is vented into a dust collecting system in which nearly 3000 lb of cork dust is collected per 24-hr period. Efficient though these collectors are, they are unable to cope fully with the large amount of very fine dust generated in the grinding and screening operations. These fines hang as a fine haze in the air and eventually settle to the floors, eaves, and building trusses in the processing area.

Because cork is a combustible substance, this finely divided dust presents an explosion hazard of some consequence — nearly equivalent to that of corn starch.

To keep the concentration of dust down to a safe level, Bond has instituted a carefully scheduled housekeeping program using an Exidust system, an industrial central vacuum cleaning system developed by Lamson Corp. The system consists essentially of a motor-driven exhauster, a circuit of metal piping that carries the vacuum in the plant, and a set of separators where the dust is collected for disposal. Vacuum piping is fitted with plug-in terminals at various locations so that flexible hoses and brushes used in the clean-up can be kept to a convenient length. To clean up a particular machine or area, the worker plugs his hose into the nearest outlet, vacuums that location, disconnects the hose, and moves on to the next area. Hinged caps cover the outlet when the terminal is not in use.

Simple Remedies Solve Maintenance Problems

Engineers at General Electric's Thomson Laboratory, studying new high temperature metal alloys for use in future electrical power generators, have found that milk of magnesia applied to furnace nuts and bolts will keep them turnable, even at very high temperatures. This simple household remedy prevented threads from melting together and locking over a period of three weeks at temperatures high enough to melt a brass door knob.

While it takes high temperatures to melt nut and bolt threads, only a small temperature rise will effect the capacity of industrial fuses. According to the engineering department of Jefferson Electric Co., based on 100 percent carrying capacity of the fuse, there is about a 10 percent loss in capacity for every 10 F rise in adjoining temperatures.

This extra heat will cause premature fuse blowing and overheating of adjacent electrical components. Fuse

boxes should be installed in locations where the temperature does not exceed 90 F. If this cannot be done, circuits should be de-rated to prevent blowing fuses.

Dynel Fabric Covers Protect Workers From Acid or Caustic Spray

Acid and caustic resistant valve and flange covers are necessary to protect workers in case of gasket or packing failure on pressurized pipelines carrying corrosive materials. Preformed lead covers, usually used for this purpose, are awkward to install and must be cut or burned off to reach the valve for repair work.

California Oil Refining Co. has adopted covers made of Dynel—a synthetic fiber developed by Union Carbide

For maintenance of valves and flanges, covers can be unwrapped and reused when repair is completed.

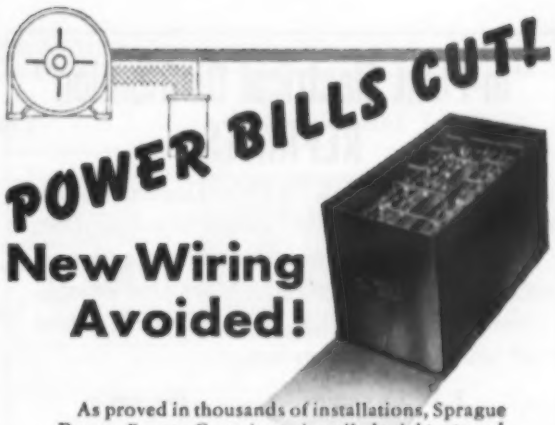
and Carbon Corp.—at the alkylation unit in Perth Amboy, N. J. The initial Dynel covers, installed a year ago, have been so successful that the refinery plans to replace all lead covers still in use.

The covers are strong enough to contain sprays resulting from line failures, are lower in initial cost and in upkeep since they can be unwrapped, laundered, and reused. Mine Safety Appliances Co. and Union Carbide designed the covers which are being marketed under the trade-name ChemKovers.

Underwriters Approves Dry Chemical Piped System

After tests extending over a five year period, Underwriters Laboratories, Inc. has officially approved dry chemical piped fire extinguishing systems as designed by Ansul Chemical Co. With this system, automatic fire protection is provided against Class B and Class C fire hazards by means of dry chemical, which is conveyed through pipes and expelled in the area surrounding the hazard.

Ansul piped systems have already been installed in the metal fabricating, aviation, petroleum, chemical, paper, and automotive industries and in the electrical util-



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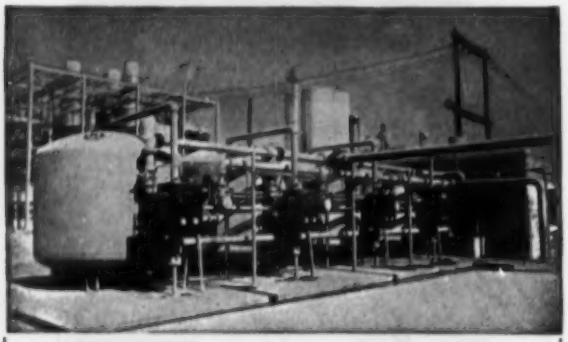

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May 12-13	Symposium on Automation	Michigan State College, East Lansing, Mich.
May 16-20	National Materials Handling Exposition	Int'l. Amphitheater Chicago, Ill.
May 22-26	Air Pollution Control Assoc. (48th Annual Meeting)	Detroit, Mich.
June 6-9	American Society of Mechanical Engineers (Oil & Gas Power Conf.)	Hotel Statler Washington, D.C.
June 7-10	American Welding Society (Spring Meeting and Show)	Hotel Muehleback Kansas City, Mo.
June 12-14	2nd Western Plant Maintenance and Engineering Show	Pan Pacific Aud. Los Angeles, Calif.
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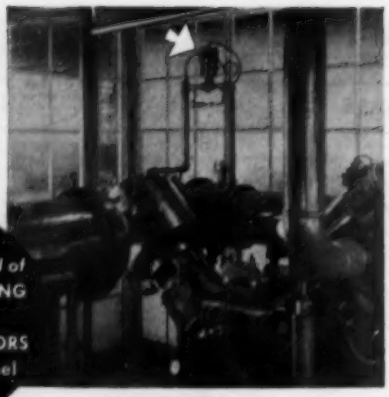

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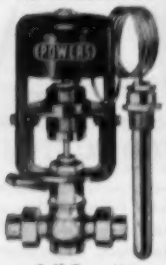

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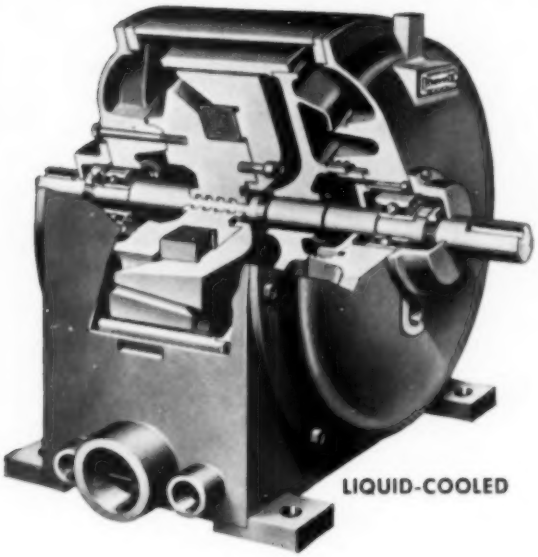

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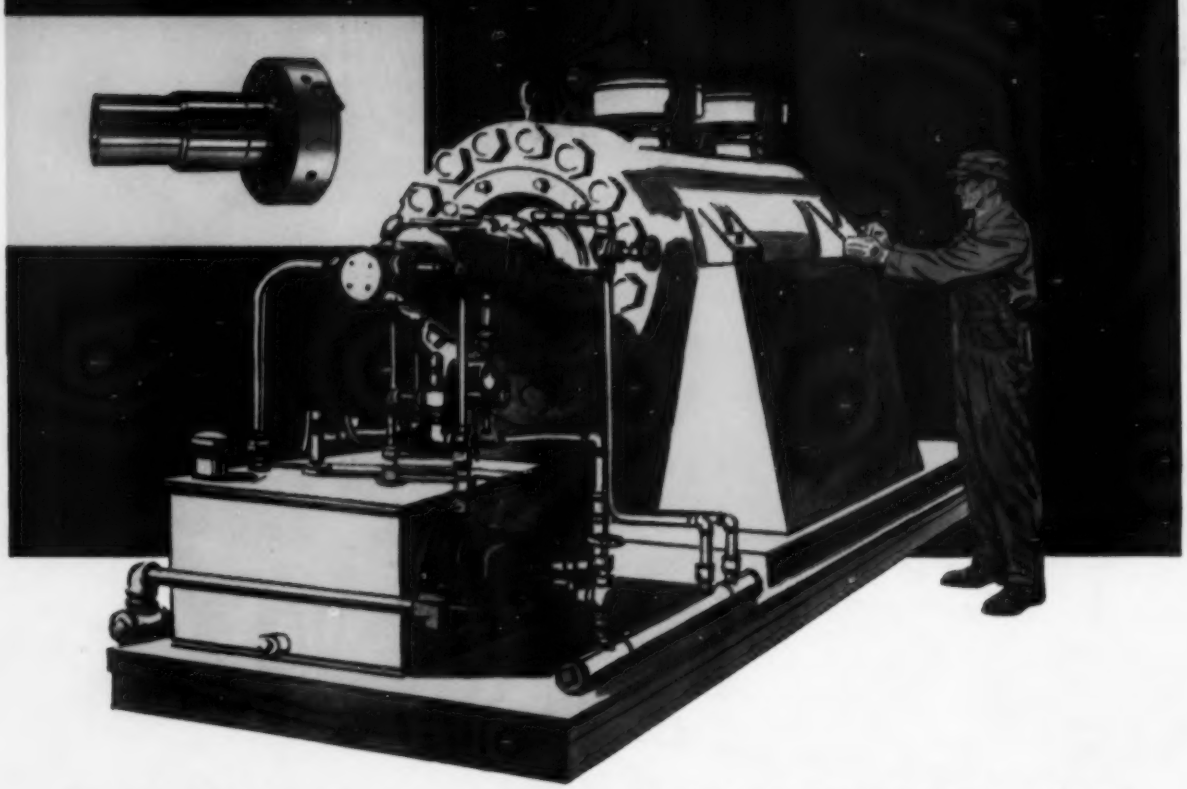

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